THE FIGHT FOR LAETRILE

VITAMIN B17

FORBIDDEN WEAPON AGAINST CANCER

MICHAEL L. CULBERT

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Illustrated

MICHAEL L. CULBERT

Vitamin B17 is the popular name for Laetrile, an extract of apricot pits. Doctors prescribe it, legally, in a score of other nations for treatment of cancer. In the U.S., thousands of Laetrile users claim benefits, often telling how they turned to it as a successful last resort after being diagnosed as terminally ill. Yet the American medical establishment—the National Cancer Institute, the Food and Drug Administration, the AMA, and state groups such as the California Department of Public Health—oppose even controlled tests on human beings. Why?

Mike Culbert, crusading editor of the *Berkeley Daily Gazette*, has penetrated the smokescreen of the medical establishment. He looks at the arguments pro and con, and concludes that there is no legitimate reason, based on existing evidence, why Laetrile should not be made legal for human use.

Mr. Culbert presents the arguments of the medical establishment, along with the mixed reports of tests conducted by the prestigious Memorial Sloan-Kettering Cancer Center of New York. But he also presents dramatic and heartrending testimonials of American patients, and exhaustively interviews the eminent medical men who support the use of vitamin B17: the American pioneer of the compound, San Francisco biochemist Ernst T. Krebs, Jr.; American doctors now using the substance, some of them undergoing legal travails for their endeavors to save lives; Dr. Ernesto Contreras of Mexico, whose Tijuana clinic has received worldwide fame as a Laetrile treatment center; Dr. Manuel Navarro of the Philippines, a Laetrile pioneer and major developer of the urine test for detection of cancer; and Dr. Dean Burk of the National Cancer Institute, the testy biochemist who has battled from within the bureaucratic structure, arguing for the fair testing and availability of Laetrile.

Most exciting of all is the potential of vitamin B17 in the *prevention* of cancer. Some

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TO

FRANK V. CORTESE, pharmacist and Americanist, who inspired
WILLIAM LOEB, newspaperman, who insisted
WARREN BROWN, JR., newspaperman, who was intrigued

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PREFACE

As this book went to press, the vitamin B_{17} (Laetrile) story was far from over. Indeed, the tide of interest in the "illegal, worthless apricot pit cancer cure" was growing irreversibly.

The units of the Committee for Freedom of Choice in Cancer Therapy had grown to 170 nationwide, and involved thousands of members and hundreds of doctors, all arguing that there are obviously some benefits from vitamin B_{17}.

More than 43,000 signatures had been affixed to petitions urging President and Mrs. Nixon to intervene personally to allow the clinical (human) testing of vitamin B_{17} (Laetrile).

The prestigious Memorial Sloan-Kettering Cancer Center in New York was continuing with animal studies using the substance. A first series of tests had been very good, a second series using different source material from the first had failed to confirm the early results, but a third series, completed in May 1974, confirmed and expanded the first tests, I learned.

On the basis of Sloan-Kettering's successful animal experiments, protocols to the Food and Drug Administration for analgesic tests of the substance on humans were being designed in June, with the first officially authorized tests on humans expected to follow shortly thereafter.

The National Cancer Institute and Southern Research Institute had issued another report denying the efficacy of vitamin B_{17} in testing it on Lewis lung cancer in mice, but the results were rebutted in detail by the NCI's cytochemistry division director who, in a final blast before retiring from the federal post he had occupied through much of his professional life, accused "certain upper NCI administrative spokesmen . . . (of) scientific and immoral falsifications amounting to corruption in the sense of the Congressional Code of Ethics."

In California, a cancer patient had sued Stanford University for refusing to let her be treated with the controversial substance, but a court denied her an order which would have allowed her to receive doses of the medicine at the university's hospital. The legal battle was still under way.

And a third trial for Albany, California, physician Dr. John A. Richardson on charges of dispensing vitamin B_{17} (Laetrile) had ended in Berkeley-Albany Municipal Court, California, with another hung jury and a dismissal of charges. The key court case opened the door for the legitimate use of the substance as a vitamin in megavitamin metabolic therapy.

In the meantime, the modern orthodox approach to cancer remained very much a welter of confusion, both in the sense of exactly what causes the disease, and how the disease can be cured, controlled and managed. The author was updated on this complexity of problems at the sixteenth science writers' seminar of the American Cancer Society in St. Augustine, Fla., during which the nation's major cancer researchers reported on the state of cancer research as of Spring 1974. Out of a sea of papers, presentations and panel

debates between the most qualified researchers, scientists and investigators in the field in the U.S.A. emerged this picture:

- The specific cause or causes of the various human cancers are not known even though, runs majority opinion, the knowledge of cause or causes does not preclude the efficacy of certain treatments.
- There is no specific evidence that viruses actually cause cancer in humans, even though a number of viruses are associated with tumor systems and viruses seem to cause certain kinds of cancer in *in vitro* laboratory studies.
- It is not specifically known what causes a natural cell to become a malignant one.
- The vast incidence of cancer in this country is undoubtedly linked, at least in some way, to the "man-made" aspects of our "civilized" environment—with alleged carcinogenic factors abounding in the air we breathe and the food we eat. Yet the modus operandi of these carcinogens remains highly speculative.
- Chemotherapy, with or without selective surgery and radiation, remains the treatment of choice in the great multiplicity of cancers even though the survival levels for most metastasized cancer remain quite low. Some optimistic evidence was presented that combinations of chemotherapy, rather than single agents, have far more effect on certain tumor systems. But even then prospects for cancer control are gloomy *unless* diagnosis and treatment are early.
- Emphasis still remains on treatment rather than on prevention, a reality pointed to by the most controversy-arousing researchers. It was pointedly put that an end to cigarette smoking would virtually eliminate lung cancer and upwards of 40 percent of cancer in American males.

For the writer, four items of major importance were forthcoming from the seminar of experts and the nation's top scientific writers:

- The viral theory of cancer, the presumption that most cancers are somehow caused by viruses, came under sharp attack by one researcher, whose contention, covered well by the rhetorical question: "Do viruses cause cancer or do cancers cause viruses?" caused perhaps the sharpest single debate at the gathering.
- Increased interest in manipulating the body's immunity system as the first line of defense against cancer (or cancers—since conventional wisdom remains inflexible that cancer is a variety of at least 100 diseases without a probable single cause or probable single cure) was demonstrated and several researchers pointed to promising experiments in the field, their key premises being that disease is primarily a response by the host to disease-causing agents (pathogens) rather than the effect of the pathogens themselves, and that the breakdown and shoring up of the body's only partially understood immunity system and of its hormone system undoubtedly play dramatic roles in cancer.
- The key importance of nutrition in preventing and causing cancer was stressed by one researcher and provoked almost as great a controversy as did the attack on the viral theory of cancer. The same researcher decried the lack

of nutritional training in the nation's medical schools and flatly stated: "Your doctor knows very little about nutrition."

• Newspaper writers from cities throughout the country reported pressure—amounting in some cases, they said, to "harassment"—from people demanding to know why vitamin B_{17} (Laetrile) is not legal in this country, why human tests for Laetrile have not yet been authorized, why more people are not looking into the thousands of testimonials and claimed case histories of cancer control by Laetrile, and demanding to know why desperate, terminal cancer patients may have no access to B_{17} in this country and, instead, literally have to go sneaking off to Mexico or West Germany or some other country where they can procure the substance and be treated.

These four items are of more than passing importance to the vitamin B_{17} story, for, as the reader will note, the essence of the vitamin B_{17} approach to cancer rests on these assumptions: There is probably a single real *cause* of cancer, even though there are multiple "organizers" which can trigger off that single cause. Cancer is manifested, first, by a breakdown in the body's immunological system, and, second, by the absence of a vital food factor in the normal "civilized" diet. How diet impinges on the latter, and how it may affect the former, makes cancer, more than anything else, a specific vitamin-deficiency disease.

In the attack on the viral theory of cancer as an across-the-board explanation of the cause of the dread disease, Dr. Paul H. Black of Harvard Medical School told the 70 science writers and editors that research is precise enough now so that "certainly caution must be voiced at the present time and theories that propose that all cancer inducing events operate via viral activation seem unwarranted and without substantial evidence."

The researcher on cancer viruses, a practicing physician, said that simply because viruses produced in the test tube may be inoculated in tissue and cause cancer tumors does *not* prove this is a natural chain of events in living organisms themselves. Indeed, he pointed out, viruses may result from tumors and certain viruses which may cause tumors outside the organism may not cause tumors in natural hosts. "Moreover, evidence is accumulating to indicate that the various inducing agents such as chemicals, radiation and hormones can cause a cancerous transformation in their own right," he added.

By *no* means was Dr. Black or any other researcher fronting for vitamin B_{17} or were they in any way connected with the latter. But their points of view opened the door further to the possibility of the essential correctness of vitamin B_{17} therapy.

Dr. Ernest L. Wynder, president of the American Health Foundation in New York, reported that there is "increasing evidence that nutrition plays an important role" among the environmental factors which are linked with cancer development. While drawing heavy fire from other scientists who have concentrated on the viral and-or other environmental but nondietary aspects of cancer induction, he did receive some support from Michigan State University physiologist and chemist Clifford W. Welsch, who, in discussing new

research on hormone relationship to cancer, said: "There is no doubt that changes in one's eating habits could profoundly influence the endocrinological system" and thus affect the relationship of hormones to cancer. He added that "we really haven't tied in nutrition with carcinogens as we should."

Dr. Wynder, who challenged the American Cancer Society to focus far more attention on nutrition, said worldwide evidence of diet and cancer "relates largely to specific deficiencies or excesses in nutritional intake—an area which we may call 'malnutrition of the affluent,' already shown to be involved in cardiovascular diseases." In fact, he argued for use of the "prudent diet" already advanced for prevention of cardiovascular disease (reducing total fat calories from 43 to 35 percent, reducing cholesterol from 600 to 300 milligrams per day, eating no more than four eggs per week or red meat more than three or four times a week) for possible prevention of cancer. He noted that "as Japanese adjust to the American way of life they assume American dietary habits, develop American cholesterol levels and also acquire their rates of heart attacks." Specific studies have shown, too, that colon and breast cancer in Japan are more common among upper-income groups which have begun to "Westernize" their diets, he reported.

Dr. Wynder also pointed to the California study of Seventh-Day Adventists, whose collective lower meat consumption, nonsmoking and nondrinking he associated with lower rates of colon, pancreas, breast and prostate cancers than in the general population. He described as "aspects of nutrition and carcinogenesis that have been generally neglected in the past and deserve more attention" the apparent relationship between cancers of the colon and pancreas to cholesterol and bile acid metabolism and the suspicion that hormone-related cancers may be linked to the effect nutrition appears to have on the constitution of cell membranes—and hence on the interrelation of hormones and hormone receptors. "I'm not saying nutrition is *the* cause of cancer, but *a* cause of major importance. It is not food additives I am talking about but excesses and deficiencies," he stressed.

At the seminar, the author asked Benno Schmidt, chairman of the President's Cancer Panel, why he had called on Sloan-Kettering to undertake preliminary tests on Laetrile, which received a rhetorical (but by no means substantive) shellacking at the gathering of experts and writers. The investment banker answered:

"I have had more mail since I've been chairman on the subject of Laetrile than on any other single subject—virtually equal to all the mail on all subjects put together.

"There is a very considerable traffic in Laetrile. We know people are going to Mexico and other countries where Laetrile is legal. My only interest in Laetrile is that we find out for an absolute certainty what it does or does not do. A great many people think it doesn't do anything worthwhile and that it's something of a hoax to push this on the American people."

At the conference, FDA Commissioner Alexander MacKay Schmidt (no relation) was on hand to claim—in the face of reports that thousands of peo-

ple report objective benefit from vitamin B_{17} -that "the fact that 10 to 15 thousand people believe that they've taken something that does them some good does not prove anything. We require some evidence, however slim, some rationale. We have traced down every lead we could find to try to determine some valid sign of efficacy [from Laetrile] and have not found any." And the ACS medical officer told the assemblage that recent National Cancer Institute studies on a specific kind of mouse tumor system treated with the substance had proved negative.

At the same time, in Washington, D.C., Dr. Dean Burk, who headed the NCI cytochemistry division until his retirement on March 31, 1974, released a lengthy, detailed rebuttal of the same study. Part of his conclusions (dated March 22, 1974):

> I should make it clear that my analyses and conclusions differ diametrically from those of the SRI-NCI report where it is concluded that Amygdalin MF (NSC B900540, a form of Laetrile) "does not possess activity in the Lewis lung carcinoma system" . . . or that "NSC B900540, either alone or in combination with NSC 128056 (beta-glucosidase), was inactive against established subcutaneous Lewis lung tumor when administered on the schedule of QD 7-15 days. . . ."
>
> In my opinion, the statistical analysis employed by the SRI was far from adequate, certain overriding biological considerations were neglected in the SRI-NCI report (though they should not have been), and, on top of this, certain upper NCI administrative spokesmen have been guilty of scientific and immoral falsifications amounting to corruption in the sense of the Congressional Code of Ethics.

In analyzing the experiments, the veteran biochemist said:

> In Exp. 34, 54 and 63, any average grammar school student could, any SRI-NCI scientist should, and any sufficiently experienced statistician would, be able to see at a glance widespread evidence of Amygdalin MF efficacy, in terms of both absolute and percent positively increased median life span, most uniformly and notably so in the treatments with Amygdalin MF alone, but also in certain instances when beta-glucosidase was additionally given.

In the meantime, the continuing Sloan-Kettering tests on spontaneous mice tumors and the NCI-SRI ones on transplanted ones cannot really be said to have addressed themselves to the primary, overriding concern: Is vitamin B_{17} (Laetrile, amygdalin) effective or not in suppressing *human* cancer? Is it effective or not in preventing *human* cancer? No amount of animal tests can possibly answer either question. All of which makes the cover letter of the Test Laetrile Now Committee to President and Mrs. Nixon and the U.S. Congress, dated February 26, 1974, particularly poignant. Chairman Jay Hutchinson wrote:

> Dear President and Mrs. Nixon and all Members of Congress:
>
> The signatures of 8,000 Americans are enclosed. The total now stands at *43,000* who have signed the Test Laetrile Now Petition.
>
> These 43,000 petitioners *DEMAND that CLINICAL TESTING START NOW!*
>
> In only 43 days an equal number (43,000) Americans have died of cancer. Unquestionably, every one of these 43,000 cancer victims would have given their consent to clinical investigators and their own physicians to administer this *non-toxic, pain relieving* substance.
>
> Every day countless numbers of American cancer victims are forced by government edict to flee to foreign clinics to obtain Laetrile therapy.

How many cancerous mice must be saved by our scientists who are aware of Amygdalin's cancer-inhibiting power before one human life is saved, or significantly alleviated, within the borders of America?

What is your response, Mr. President, Mrs. Nixon, and Members of Congress, to the American cancer victim who has been told "there is *nothing* more we can do for you"?

We, the people, if not the physician, can do something—we are doing something to save our lives. We need your help. *Now*.

To anyone who has ever witnessed the slow, agonizing death of a terminal cancer patient for whom even orthodox pain killers may provide only a whisper of relief, the question "Why *not* test Laetrile?" becomes thunderous indeed.

Whether the FDA thinks so or not, there *is* a "valid sign of efficacy" in Laetrile. It is a bureaucratic obscenity that access to vitamin B_{17}, so legal elsewhere and so much the subject of reliable research in other countries, must remain so taboo in the United States. No one, certainly not this writer, is arguing that vitamin B_{17} is the one, final answer to the cause and control of cancer. But surely it is a valid approach. It surely deserves far more official interest than it has received. It deserves, openly and legitimately, its honest day in court.

Oakland, California
June 1974

ACKNOWLEDGMENTS

The author, who pleads guilty to being a newspaperman rather than a scientist, wishes to thank, effusively, all the principals in the story of vitamin B_{17} (or Laetrile) for their helpful guidance in developing this account—most particularly vitamin B_{17}'s main pioneer, Dr. Ernst T. Krebs, Jr.; its primary champion within the federal government, Dr. Dean Burk, National Cancer Institute, cytochemistry division, who faced mandatory retirement in 1974; Dr. Krebs's mentor and an outstanding pharmacologist and Beardian, Dr. Charles Gurchot; Andrew R. L. McNaughton, founder and president of the McNaughton Foundation, sponsor of Laetrile research around the world; Dr. John A. Richardson, Albany, California, whose courage in treating his patients the best way he knew how produced the legal spark that may very well have turned the tide in the vitamin B_{17} story; Dr. Ernesto Contreras, Tijuana, Mexico, the most seasoned Laetrile therapist in the field; and Dr. Manuel Navarro, Republic of the Philippines, a Laetrile pioneer who battled ceaselessly for the vitamin B_{17} approach in Asia.

However, the book would not have been written without the important help of its major heroes and heroines—the men and women who spoke freely about their experiences with Laetrile as terminal cancer patients. They allowed me to come into their private lives and spoke candidly and convincingly of their cases. To them, including the heroic battlers who later died, my eternal thanks.

Others played important roles by providing suggestions, clarifications, research help, and general information or help, and are deserving of my gratitude: Dr. Stewart M. Jones, Palo Alto, California; Wynn Westover, a staff consultant of the McNaughton Foundation, Sausalito, California; Jean Blasdale, Berkeley, California; Malvina Cassese, San Francisco, Dr. Krebs's longtime secretary; Richard Ramella, a reporter for the *Independent-Gazette* of Richmond and Berkeley, California; my good friend Joaquin Relloma, Mountain View, California, laboratory assistant and student of biology; Charles Dahle, director of public information, American Cancer Society, California Division; Robert M. Hadsell, Ph.D., Public Affairs Office, National Cancer Institute; and Donald Allison and Matthew Jacobson, copyboys and ever dependable and indispensable aids to a newspaper editor.

Any errors and omissions are entirely the fault of the author.

VITAMIN B17

1

An Apricot Pit on Trial

In June 1972, San Francisco Bay Area news media were alerted through friendly overtures from the Alameda County district attorney's office that a newsworthy "bust" was in the works. Sure enough, state and local officers, armed with warrants charging Albany, California, physician Dr. John A. Richardson and two of his nurses with multiple violations of the state's "cancer quackery" statutes, burst into the doctor's clinic.

In a move that the respected medic referred to as "Gestapo tactics," officials confiscated his records and arrested him and two nurses, because, said the state, they had dispensed an illegal substance called Laetrile to cancer patients, one of whom turned out to be an undercover agent. And Laetrile for use in cancer therapy is expressly forbidden by sections of the California health and safety codes.

As it turned out, Dr. Richardson proved to be the wrong man arrested in the wrong place at the wrong time on the wrong charge—depending, of course, on how one views the wide-open controversy surrounding Laetrile, now increasingly known as vitamin B_{17}. For the arrest of Dr. Richardson, an outspoken John Bircher not known to back away from a good fight, was tantamount to arresting the Birch Society itself, although the conservative organization took no stand, as a society, on the matter. The Richardson arrest marked the explosive entrance into the vitamin B_{17} controversy of numerous Birchers, many of them grouped in a complex of ad hoc committees collectively known as the Committee for Freedom of Choice in Cancer Therapy, Inc. Between the time they were set up as support groups for the Richardson trials and February 1974, there were 127 of the ad hoc committees nationwide, including Alaska, Hawaii, and Puerto Rico, and inquiries had come from Spain and New Zealand about setting up such pro-Laetrile organizations there.

At least 5,000 contributors and members, including an estimated 400 practicing physicians, worked in the committees. Additionally, a more vintage pro-

Laetrile group, the International Association of Cancer Victims and Friends, and the fledgling Cancer Control Society, received fresh ammunition in their battle for the legalization of Laetrile—the brand name for a purified, crystallized, freeze-dried form of the compound amygdalin. The product, while available for use legally in twenty-three other countries, had been in essence proscribed from interstate shipment and sale in the United States for a decade and specifically prohibited since 1963 from use in cancer therapy in California, where it was pioneered.[1]

The existence of the ad hoc committees brought forth hundreds of new testimonials to add to the thousands that had been accruing since the early 1950s, all attesting to Laetrile's dramatic effects, which ranged from relief of pain (the single most overwhelming symptom reported) to spectacular regressions of tumors and even complete recoveries. What had been a simmering hostility between proponents of Laetrile and of entrenched medical orthodoxy and governmental bureaucracy erupted into an open war.

Supplies of Laetrile manufactured in Tijuana, Mexico—where thousands of American patients had gone seeking treatment since 1963—were somewhat curtailed in 1973 by a crackdown on alleged smugglers of the substance in its injectable and pill forms. Letter-writing campaigns had brought the matter to the attention of the Nixon administration. Newspaper series and television investigations turned the Laetrile controversy into a national news story. While officialdom continued claiming absolutely nil effects from Laetrile treatment and insisted that Laetrile was a "worthless" extract of the apricot pit, more and more credible people stepped forward with credible case histories of Laetrile's efficacy. Mixed results from tests at the prestigious Memorial Sloan-Kettering Cancer Center served as a stimulus for more demands to "Test Laetrile Now!" and to prove that "Laetrile Works—You Bet Your Life!"—the slogans of pro-Laetrile organizations in 1972 to 1974.

Dr. Richardson readily admitted he had indeed dispensed Laetrile to his patients—but only, he argued, as vitamin B_{17} and as part of a general megavitamin therapy. He insisted that such usage was legal under California law, since amygdalin is recognized as useful in metabolic deficiency.

A tantalizing legal question had arisen: if it was legitimate to use amygdalin (the chemical, generic term for Laetrile or vitamin B_{17}) in megavitamin therapy, then a hole had been opened in the patchwork of laws making the sub-

1. Food and Drug Administration (FDA) spokesmen have stated that there is no single regulation which "bans" the interstate shipment and sale of Laetrile, and that FDA considers the assertion there is such a ban "unfortunate." However, the FDA statement of September 1, 1971, reporting on consultants' findings on Laetrile, reads, in part: "Under the FDA position reinforced today by the Ad Hoc Committee findings, Laetrile (amygdalin) may not be promoted, tested, or sold in the United States under provisions of the Federal Food, Drug and Cosmetic Act until the necessary basic studies have been accomplished." The FDA points out that *no* product which has not been cleared for an Investigative New Drug (IND) order may be so sold or shipped. Laetrile falls into this category, but there is no specific anti-Laetrile regulation. Hence there *is* a ban against it, though not a specific one, and more than one attorney has questioned whether FDA statements and general regulations constitutionally have the force of law. (See chapter 5.)

stance illegal in the treatment of cancer. The case became a landmark one and interest in it grew with the velocity of a fulminating neoplasm.

The long, involved court process got under way in the municipal jurisdiction of Berkeley, California—perhaps the most innovative, unorthodox and "antiestablishmentarian" city in the United States, whose very name conjured up clichés ranging from "Athens of the West" (with love) to "Peking East" (with hatred) and whose institutions had been sorely tested by activism and revolt since the onset of the Free Speech Movement (FSM) in 1964-65 at the University of California, whose mother campus is there.

Having covered explosive, radical Berkeley since 1964, I as a newsman was particularly interested in what kind of theatrics might accompany the court appearances of a conservative and John Birch Society member like Dr. Richardson. The courthouse in downtown Berkeley had been for years the scene of many demonstrations and near riots, ranging back to the FSM and Vietnam Day Committee periods. Its chambers had literally teemed with hundreds of mostly young, mostly hip, mostly radical communards in Berkeley sometimes called "the counterculture" or, by the *Berkeley Daily Gazette*, "anarchoradiboppers."

When Dr. Richardson appeared for arraignment, and then for his first trial, hundreds of individuals showed up to view the proceedings. They were not only "streets" but, in the Berkeley parlance, "straights"—clean-cut men, traditionally dressed women. No placards, no chanting, no revolutionary slogans, no disruptions from this assembly.

For months the Richardson case moved in and out of court, ultimately landing in Alameda County Superior Court, where the doctor, convicted on five counts of violating health and safety codes, switched attorneys and types of attack. A legal snarl ensued as the case became a pitched courtroom confrontation between the ever-growing legion of Laetrile supporters, users, and backers and the state of California's rigid legislation against its use. This was a bellwether case that could break the federally imposed ban on the use of the substance in cancer therapy nationwide.

The appellate division of the Alameda County Superior Court reversed the convictions of Dr. Richardson and nurses Margaret Grosch and Charlotte Anderson on a series of technicalities in 1973, and a new trial was ordered. The second trial began in Berkeley-Albany Municipal Court, during which time various counts were dropped and others added. The Albany physician continued, during the whole period, to use Laetrile in his general megavitamin therapy.

After three weeks, the second trial ended in a hung jury, with jurors noting that a majority of them favored outright acquittal. A third trial was ordered for 1974 as a U.S. federal judge refused to hear the case until Richardson and his attorneys had exhausted all state-level legal alternatives. It, too, resulted in a hung jury.

The on-again, off-again case was the center of attention as a Laetrile propaganda war raged on both sides. The Food and Drug Administration, National Cancer Institute, and American Cancer Society, routinely asked by citi-

zens why Laetrile was not legal, put out their customary denunciations, most of them based on an early series of tests done in California in 1953. The line was united and ever recurring: there is no substantive evidence that Laetrile has antitumor effects and testimonials don't mean very much; what's more, it might be dangerous.

The pro-Laetrile groups and those interested in natural foods and nutrition denounced the FDA, American Medical Association, and American Cancer Society as either blind or malicious or both. Raised was the argument that cancer is a multi-billion-dollar industry that would be ruined if it could be shown that cancer is (like scurvy, rickets, pellagra, pernicious anemia, beriberi, and other maladies) a vitamin-deficiency disease, and that medical orthodoxy and bureaucratic officialdom were protecting this industry.

The situation was tailor-made for Birch input: the crackdown on Laetrile, Birchers and non-Birchers claimed, was fresh evidence of a conspiratorial government involved with pharmaceutical monopolies or engaged in an insidious scheme to allow government to "discover" Laetrile as a cancer cure and use it as a pretext for socializing medicine, or both.

The extremist positions at both ends—the one, that Laetrile is utterly worthless and merits no further time and effort; the other, that Laetrile and the theory behind it constitute the final, definitive answer to cancer—obscured, as usual, the more centrist reality. Obviously, there is something to Laetrile, and the growing wave of evidence makes a compelling case for facing this fact without assuming Laetrile is the total answer or that all opposition to Laetrile has an identical vested interest in its suppression.

While the ad hoc Committees for Freedom of Choice were at work, the California-based Test Laetrile Now Committee was busily circulating petitions for signatures to send President and Mrs. Richard Nixon, urging them to intervene with the FDA and "clear" Laetrile, a substance pioneered twenty years earlier, for clinical tests on humans. As the first phase of the Test committee came to a close, its chairman, Jay Hutchinson—a San Francisco insurance salesman and a onetime terminal cancer patient and Laetrile user who was diagnosed in September 1971 as suffering from lymphosarcoma—had gathered 35,000 signatures. They came from many of the several thousands (no one knows for sure how many there are) of Americans who are using, or have used Laetrile.

A second letter-writing effort involving Hutchinson and Cancer Victims United went in December 1973 to the Nixons to complain that the U.S. Customs Department "is preventing life-maintaining supplies of Laetrile from reaching us here in the United States. Please issue a Presidential Decree of Mercy . . . so that those of us patients already taking Laetrile may continue the effective control of cancer we have established within ourselves using this substance." It went on to state that "the FDA and the Customs Department people have apparently agreed that the best way to eliminate the favorable case histories of the control of our cancers by Laetrile is to stop all supplies, thus

depriving us of this life-sustaining substance."[2]

Indeed, as Customs officials told Frank Winston, who was at that time west coast editor of the *National Tattler,* eleven people had been arrested on the California-Mexican border between August and the end of 1973 as smugglers of Laetrile. Most were Mexican nationals, and the arrests were carried out because the size of the supplies seized indicated a "commercial" intent. Usually, however, customs officials looked the other way when American cancer patients recrossed the border from Tijuana with their own personal supplies of the substance. The standard practice was to allow them to cross without difficulty if they could produce a prescription for the medicine, which achieved full legal status in Mexico in 1973.

But the going could get rough. A thirty-five-year-old attorney from the Bay Area, diagnosed in California as a terminal cancer patient after a mole in his armpit developed into a metastasized, runaway melanoma, told me his case, which was fairly typical. Diagnosed in the middle of 1973 and given the word, the attorney decided, as so many had, to make the "Tijuana connection." He visited the clinic operated by Dr. Ernesto Contreras, received treatment, returned, and decided to go back for $300 worth of Laetrile, put up in vials. He had lost considerable weight and was quite weak, but nonetheless ambulatory. When he attempted to recross the border with his supply of Laetrile vials, he was questioned for better than an hour, his rented car gone over thoroughly, and he sustained what he felt to be harassment. He was eventually allowed to continue his trip and arrived, weak and chagrined, at the San Diego airport. There the security metal detector reported his cache of Laetrile vials and he went through the process again: temporary police detention, explanation, and myriad questions. But he was allowed to continue on and did so.

No small part of the problem, of course, is due to the heavy narcotic flow into California from Mexico at the busy Tijuana border. The attorney took this into account while suffering the agony of trying to explain what he was doing and why. After several months of Laetrile treatment, the attorney—who sought anonymity because he was connected with a public agency—said he was sensing relief from pain and a reduction in facial edema although his tumors persisted. He believed he was getting positive benefit from Laetrile and was using virtually all his savings to secure a continual supply of it. He was angry, as were so many, that he had to undergo the Tijuana connection to secure a product that is nothing more than highly processed, concentrated amygdalin extracted from apricot pits.

Whether he, like so many, had turned to the banned medicine too late remained to be seen. A year and a half later he was definitely on the upswing, the metastases stationary and his energy returning. Most Laetrile users are terminal patients who only turn to the unorthodox approach after orthodox science has given up on them, as indicated by the testimonials in chapter two.

There were spectacular cases, though, going into 1974, indicating early and effective response to the treatment.

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2. Copy of letter with the author.

An eighteen-year-old Plainview, Minnesota, youth who had been diagnosed with what had begun as testicular cancer, stunned Minnesota television audiences with his case history, which had involved the prestigious Mayo Clinic. He was diagnosed first at a Minnesota hospital, then underwent exploratory surgery at Mayo. He was told, according to his parents, that he would need cobalt treatment. His mother recalled that the physician told him of a host of bad side effects from the cobalt and indicated he might have only a year to live even with the treatments. That was in early 1972. His parents had already heard of the Laetrile treatment and knew that the only place relatively close to procure it was Tijuana.

The young man went to Tijuana for treatment in January 1972 and was there until May 1972, he and his father recalled. He underwent the standard Laetrile injections at the Contreras clinic and was also given enzymes and a strict diet. He returned home and continued taking the Laetrile tablets until September 1972. All cancer systems vanished. Subsequent checkups by U.S. doctors, his parents insisted, showed him to be cancer-free. One of his original physicians was quoted as saying: "We are at a loss to explain what happened" in his case. Under the usual Laetrile treatment, a cancer victim is assumed cancer-prone for the rest of his life and the usual procedure is to keep him on a Laetrile maintenance intake for his lifetime, much as a diabetic must stay on insulin. The young man "felt fine" when I talked to him in January 1974.

Such varied results came as no surprise to several solidly credentialed clinicians around the world where Laetrile therapy is legal (if by no means preferred). Cancer and other therapy with amygdalin was reported in the Soviet Union in the 1970s, and Yugoslavia was known to have its own amygdalin processing laboratory.

The scientific controversy around Laetrile, fought in medical journals and occasionally in the press, had, then, sputtered intermittently for years. It was the raid on Dr. Richardson's office that made Laetrile hot news once again—and also convinced me to get cracking on untangling the full, incredible story of a banned substance that otherwise reliable doctors and scientists held to be a cancer palliative at worst and an outright "control"—not a cure—for the dread Big C at best.

Instantly, the Richardson case not only triggered off the swift development of ad hoc committees; it also wrought a strange coalition between the hard-right traditionals and the hard-left counterculture, a phenomenon most noticeable in ever-against-the-grain Berkeley. It was not uncommon in 1972 to see many psychedelically painted campers and panel trucks, irreverently referred to as hippie vans, plying the streets of Berkeley, San Francisco, and the Bay Area cities and bearing such seemingly disparate bumper stickers as "Vote McGovern" and "Test Laetrile Now!" The marching slogan "Laetrile Works—You Bet Your Life!" might be seen on a hippie van or a luxury vehicle.

Indeed, the natural-health-nutritional-therapy wing of the back-to-nature counterculture found in the plight of Laetrile and of the good Birch doctor a

sympathetic overlap with the straight world. Both sides could cheer as the Albany medic went before 1,100 people in San Francisco's Fairmont Hotel in early 1973 to rip the "tinseled tones and lilting lies" of "medical bureaucrats" and scorn the "tinhorn megalomaniacs safely ensconced in the federal bureaucracy who harass men and women who are continuing to do their duty to God, family, and country."

Dr. Richardson, a handsome and articulate new hero of the Laetrile cause, stumped the state and the nation proclaiming the vitamin B_{17} gospel to an ever-increasing audience. Cancer, he told anyone who would listen, is primarily a specific vitamin-deficiency disease. A substance called vitamin B_{17}, occurring naturally in more than 1,200 plants, vegetables, and grasses (and not recognized as a vitamin by the FDA, the American Medical Association, and the American Cancer Society), is the specific vitamin that provides the body's essential backup defense against cancer, and the incidence of cancer is epidemic in many civilized countries because some natural vitamins have been removed from processed foods.

The corollary, so heartening to antiestablishmentarians of all stripes and which helped to weld the strange coalition of Laetrile advocates, is essentially this: The medical elite and the corresponding government bureaucracy are somewhere between being pervasively naive and criminally irresponsible in disallowing the "unofficial" clinical evidence for the efficacy of vitamin B_{17}, while a mammoth "cancer industry"—expressed in hospitals, surgery, radiation, treatment, and highly toxic chemotherapy—has become a multi-billion-dollar annual operation. And all this while between 350,000 and 365,000 Americans are dying of cancer yearly—about a thousand a day—while cancer fatality levels in this country have reached a twenty-two-year high.

The Richardson arrest and subsequent litigation were by no means isolated incidents in the lengthy, disjointed, on-again, off-again story of Laetrile or vitamin B_{17}—words created by San Francisco biochemist Ernst T. Krebs, Jr. to define both the processed form of amygdalin and the whole class of natural substances, of which amygdalin is the most medically prominent representative. Krebs and his father, the late Ernst T. Krebs, Sr., M.D., who died cancer-free at age ninety-three by falling down the stairs in the Krebs family mansion in San Francisco, had run afoul of the FDA and state laws on several occasions because of their work in developing and manufacturing Laetrile.

In February 1971 state agents arrested Krebs Jr. and four others, including a woman who ran a rooming house catering to Mexico-bound cancer patients, on a variety of state health-law violations. The biochemist, about whom much more later, told me the quintuple arrests preceded the airing of an NBC television program on Laetrile. "We know the orders come down from on high," said the thick-jowled scientist who devoted most of his college life and his entire professional life to the conquest of cancer. "As long as what we're doing doesn't receive public attention, they let us alone. But within twenty-four to forty-eight hours of major publicity, the FDA moves vigorously and viciously."

In May 1971 the California Department of Public Health actually tried to secure a court order that would have prohibited the publication of articles suggesting the efficacy of Laetrile. A superior court judge, happily, bounced the case out of court as a violation of the First Amendment. This decision set the stage for champions of vitamin B_{17} to hold major conventions throughout 1973 attended by up to 1,500 people each, during which the alleged benefits and controlling properties of the substance were discussed.

Earlier, on March 12, 1970, the Pennsylvania Health Department swooped down on a meeting of the Harrisburg Natural Food and Health Association after the movie *Laetrile, Nature's Answer to Cancer* was shown. The film was confiscated and the association president, Bruce Butt, arrested. Urged by officialdom to plead guilty, Butt refused. The National Health Federation stepped in to give him a legal hand and two years later he was exonerated of the "cancer quackery" charges leveled against him. Arrests of several members of the International Association of Cancer Victims and Friends (IACVF), at age twelve the grandfather umbrella organization pushing for official recognition of Laetrile and other allegedly nontoxic and nutritional approaches to cancer, followed the same year.

Inasmuch as the FDA had refused in 1963 to allow interstate shipment of Laetrile, and inasmuch as the official line, developed ten years before, was that the substance was worthless, and inasmuch as many state health codes contain provisions against the use or advocacy of unofficial cancer treatments, doctors who dared use or advocate Laetrile were quite literally risking their careers. As terminal cancer patients were denied access to an unofficial alternative treatment in the United States, and as American doctors risked heavy penalties and court costs if they were in any way involved with the Krebs discovery, it was no mystery that many patients began seeking the nearest source of open, legal Laetrile treatment—Tijuana, Mexico. But when not flocking to Dr. Contreras's clinic and hospital in Mexico, more affluent terminal cancer patients headed for Dr. Hans Nieper's facilities in Hannover, West Germany, where general therapy in which amygdalin played a central role was available.

Not until Dr. Richardson became involved in Laetrile therapy and he was arrested for his efforts did it come to public notice that a handful of American physicians were prepared to risk their professional lives by making the illegal compound available in cancer treatment. At the beginning of 1974, Dr. Richardson told me he had treated more than 750 patients with his megavitamin therapy that included vitamin B_{17}, actions which were an open testing of California Health and Safety Code statutes banning the use of "laetriles" (specifically, amygdalin and prunasin) in cancer treatment. Also by the beginning of 1974, an Atlanta urologist, who became a true believer in Laetrile after attending a San Francisco seminar on the subject a year before, said he had treated eighty patients, and had been able to do so under Georgia law.

But a key legal question remained, for the time, unanswered: Does a terminal, dying cancer patient *not* have the right to access to a substance, however opposed it may be by the American medical establishment? Some states

seemed to say he does have that right, at least inferentially. But in California, birthplace of the development of Laetrile and discovery of vitamin B_{17}, the "drug" remained vigorously opposed. And, as far as federal law was concerned, Laetrile remained illegal for interstate sale and shipment.

As to the matter of the rights of a dying cancer patient, one of Dr. Richardson's first attorneys, the colorful Gen. Clyde Watts (a onetime counsel for Maj. Gen. Edwin A. Walker, the career army man who ruffled Washington feathers for propagandizing his troops with Birch Society material and leading an antiintegration march at the University of Mississippi), came up with a fresh idea. He entered a suit against federal authorities on behalf of an Oklahoma terminal cancer patient denied access to Laetrile, a constitutional class action suit "on behalf of all people dying of cancer." Unfortunately, Watts's client died before the suit was filed.

But George Kell of Modesto, California, another Richardson attorney, decided to argue the Richardson case in part on the basis of the Supreme Court decision in *Jane Roe* v. *Henry Wade,* in which the Court held that the doctor had the absolute right, in his medical discretion, to take the life of a human fetus at any time before the first trimester. Kell convincingly claimed that the decision "created a hideous anomaly in the law" in that the cancer patient does not have the freedom of choice in preserving his own life that the mother has in taking the life of the fetus.

Elsewhere, two East Coast attorneys sued the FDA and five other government agencies for preventing their clients from obtaining Laetrile as a treatment for cancer.

While the legal front kept Laetrile or vitamin B_{17} in the news, personalities also played a key role. It was at a Los Angeles convention of the Cancer Control Society in the summer of 1973 that Alycia Buttons, wife of comedian Red Buttons, was on hand to announce that she had been rescued from death's door by amygdalin—a belief she shared at the personal level with several hundred other cancer patients meeting at a conference which would not have been legal two years earlier if the state health department had had its way.

Of equal impact at the convention was word from Laetrile's only "inside" battler, Dr. Dean Burk, head of the federally funded National Cancer Institute's cytochemistry division and a major gadfly in the side of the medical-bureaucratic establishment. He announced that—with the chairman of President Nixon's advisory board, which supervises the administration's National Cancer Plan, playing a direct role—Memorial Sloan-Kettering Cancer Center in New York had begun the serious testing of Laetrile. Actually the tests, on mice, were well under way, and, as the advisory board chairman, investment banker Benno C. Schmidt, told the Associated Press, S-K began its studies after he had received "hundreds of letters about Laetrile and began to look into the matter." Finally, Laetrile was on the way to getting at least a partial hearing at one of the major cancer research institutions in the country.

For Dean Burk, a biochemist who had openly and vociferously assailed medical officialdom for years for its refusal to clear Laetrile for tests on

humans, Sloan-Kettering's interest represented a victory of sorts—a major milestone on the road to possible legalization. His sentiments were echoed months later by Sloan-Kettering itself. In a preliminary report on Laetrile tests on mice, one purposely leaked to the press (but not by the institution itself) as an adjunct to the Richardson case, it was revealed that in a ten-month series of experiments involving a strain of mice that develop breast cancer, Laetrile doses caused "significant inhibition of spontaneous mammary tumors" as well as "significant inhibition of the formation of lung metastases," and "possibly prevents, to an uncertain degree, the formation of new tumors. . . ." Although spokesmen for Sloan-Kettering pointed out, to those inquiring wire services that reacted upon release of the news leak, that Dr. Kanematsu Sugiura's tests were not complete and that Sugiura was only one member of a team working with Laetrile, the impact of the news was traumatic.

For the first time, a prestigious and "orthodox" cancer facility in the United States had conducted controlled tests, however narrow of range, in a thorough, scientific way, and had come up with positive results. Even later Sloan-Kettering statements that another series of tests had failed to confirm the earlier findings failed to dim the enthusiasm of the laetrilists—for, as Ernst Krebs, Jr. observed, there was no way to erase the results of the earlier tests. A successful third series was completed as this was written, and it was only a question of time before open, legal tests on humans would occur, if only, initially, to probe Laetrile's consistently demonstrated analgesic effects.

The early release of positive test data embarrassed Sloan-Kettering. A researcher on the project told me that he personally was disgruntled by the early "leak," and that it was too early to make sweeping generalizations. Yet he added he was moving toward the point of view that nutrition plays an overwhelming role in cancer prevention.

Perhaps the best reporting on the Sloan-Kettering matter was that in *Science* by Barbara J. Culliton, who noted that "the conclusion Sloan-Kettering scientists draw from these [mice] data is that Laetrile is worth further study, even though there is no convincing scientific basis for its use in human beings as yet." She quoted Benno Schmidt: "Since I've been chairman of the President's cancer panel, I've had literally hundreds of letters about Laetrile. Some people ask me whether it is any good. Others flatly say that, in any case, it alleviates pain. When I answer these people and tell them that Laetrile has no effect, I would like to be able to do so with some conviction."

Taking the matter up with the National Cancer Institute—whose cytochemistry chief, Dean Burk, vigorously and outspokenly dissented from the NCI view—Schmidt was told that Laetrile had been looked into and that there was no basis for claims made about Laetrile's capability as a cancer fighter. He heard the same story from the American Cancer Society. But, he recalled,

when he asked for evidence, "I couldn't get anybody to show me his work."[3]

Dr. Chester Stock, vice president of Sloan-Kettering, commented for Associated Press on the mixed results of the S-K tests. His investigators, he said, had not—under the conditions used—been able to show that there is the precise difference between cancer and normal cells (in suggested enzyme activity releasing cyanide at cancer sites) that Laetrile's defenders claim. "We think it's just flawed theory," he said. But that there could be other mechanisms at work that might produce an anticancer effect, he said, seemed obvious since two sets of Sugiura experiments showed that:

1. Larger tumors did not stop growing when amygdalin was used—but smaller tumors in general did not grow any further.

2. Results of metastases (spread) cancer were more interesting. Of the mice at the end of the experiment which were not treated, eighteen or 78.2 percent had lung metastases present. Of those treated with amygdalin, only four or 17.4 percent exhibited metastases.[4]

While the partially successful results at Sloan-Kettering were fresh in mind, more news was forthcoming at an international meeting in Baden-Baden, West Germany. Results of successful treatment of mouse tumors with amygdalin had come from the Manfred von Ardenne Research Institute in Dresden. A translation of the report, "Prolongation of Life in Tumor-Bearing Mice by Bitter Almonds," summarized: "In mice with Ehrlich ascites carcinoma, bitter almonds taken in addition to standard feed in a free food choice caused a significant prolongation of survival time, which is associated with inhibition of tumor growth."[5]

The Dresden report was key: bitter almonds are a primary source of the specific chemical substance (beta-cyanogenetic glucosides—or "nitriloside," as coined by biochemist Ernst T. Krebs, Jr., along with the denomination vitamin B_{17}) that the laetrilists assert is both a preventative against cancer and a "control" thereof.

Back in the United States, however, the official position remained inflexibly the same—and the National Cancer Institute pointed to a whole new set of statistics to prove it. On December 19, 1973, Saul A. Schepartz, associate director for drug research and development at the institute, released this statement:

> I am attaching a report from Southern Research Institute summarizing and evaluating four experiments that we carried out with Amygdalin MF against the Lewis lung carcinoma. Based on this total experience, the conclusion has been reached that this material does not possess activity in the Lewis lung carcinoma system. We had previously reported that Amygdalin MF had been tested in a variety of other experimental tumor systems without evidence of activity. With the receipt of this report, we have now completed all of our

3. Barbara J. Culliton, "Sloan-Kettering: The Trials of an Apricot Pit—1973," *Science* (December 1, 1973).

4. Brian Sullivan, Associated Press, February 4, 1974.

5. P. G. Reitnauer, in *Arch. Geschwulstforsch* 42, no. 4 (1974): 135-37.

projected testing with Amygdalin MF. Based on all of the studies we have carried out, we conclude that the material does not possess activity in any of the tumor systems that we have utilized. No further experiments are contemplated at this time.[6]

This kind of summary further bolstered the NCI's official position, as stated by C. Gordon Zubrod, director of the institute's Division of Cancer Treatment: "Laetrile (Amygdalin MF) is not considered a recognized treatment for cancer. Although Laetrile has been widely used in a number of countries, claims concerning its effectiveness are based on anecdotal reports and to our knowledge the type of carefully controlled clinical study necessary to determine the properties of an anticancer drug has been neither conducted abroad nor reported."[7] The Zubrod statement recalled earlier NCI tests that had been dismissed as negative.

To all of which Dr. Dean Burk said, "Nonsense!"—as he had statistically demonstrated on prior occasions, in which he dissented from the global conclusions reached by the NCI at the end of its studies. Burk declared in February 1974 that the Southern Research Institute studies make a case *for* the efficacy of Laetrile (amygdalin, vitamin B_{17}) rather than its worthlessness. "You may say the evidence is not only overwhelming—it is overwhelmingly overwhelming," the veteran scientist told me. This was the same outspoken researcher who frequently referred to the "output of obfuscations, deceptions, deviousness, red herrings, or actual lies regarding Laetrile," and who observed in a letter to a congressman, "Once any of the FDA-NCI-AMA-ACS hierarchy so much as concedes that Laetrile antitumor efficacy was indeed even once observed in NCI experimentation, a permanent crack in the bureaucratic armor has taken place that can widen indefinitely by further appropriate experimentation." (See chapter nine.) Burk's counterstudies are at least evidence that experts can disagree on findings.

I should point out here, and strongly emphasize, that neither Dr. Burk, nor Laetrile's developer and pioneer, Ernst T. Krebs, Jr., nor the Laetrile-using physicians around the world have ever regarded vitamin B_{17} as a *cure* for cancer. In its oral and injectable form, they insist it is the best cancer weapon we have. The most exciting possibility of all, of course, is their insistence that vitamin B_{17} may be *the* preventative against cancer; that if enough of the vitamin were taken in through natural foods, there would not be any need for the processed, commercial product called Laetrile.

As a newspaperman, I covered the vitamin B_{17} story in starts and stops since 1971. I interviewed a score of people in the Bay Area who credibly told of seemingly incredible "controls" accomplished through cancer therapy centered on vitamin B_{17}. At the Richardson trials scores of new testimonials were made known to me from Committee for Freedom of Choice in Cancer Therapy members who were patients of Richardson, Contreras, or Hans

6. Memorandum and statement from National Cancer Institute, dated December 19, 1973.

7. *Ibid.*, dated October 26, 1973.

Nieper. From what my interviewees told me—all in such glaring contradiction with what officialdom told me—it seemed from the outset that there was more to Laetrile than the bureaucratic dismissals of it would indicate.

I interviewed Dr. Ernesto Contreras in Tijuana, Dr. Dean Burk during his trips to the West Coast, and biochemist Ernst T. Krebs, Jr. frequently and exhaustively. I met with Dr. Manuel Navarro in the Philippines for his views, with Dr. Stewart Jones in Palo Alto, California, and was in touch with other researchers and with case histories and medical reports.

Fascinating questions nagged: Is it possible that cancer, in its cause, treatment, and prevention, involves a simple answer? If the substance vitamin B_{17}, is legal for use elsewhere, why the almost emotional rejection of it in the United States? Are thousands of Laetrile users and a substantial number of scientific supporters of the Krebs theory and product all deluded? As a layman, I cannot now say I have all the answers. But I have vigorously pursued them.

By early 1974 several things were happening on the vitamin B_{17} front:

- There were disputes within the Laetrile movement itself. Some feared the presence of John Birch Society elements, declaring that the latter wished to make Laetrile a kind of political football. Others argued that the Birch presence was the saving grace for the compound, noting that without the Birch presence and dedication in helping to organize ad hoc committees, the application of legal pressure and public information on vitamin B_{17} might have been nowhere as strong as it was.
- There were arguments over what constituted "legitimate" Laetrile and what its price should be, and over what, if anything more sinister than applying the law, was behind the U.S. Customs crackdown on Laetrile smuggling.
- There were laetrilists who believed that the theory on which Ernst Krebs, Jr. based the development of the substance was wrong, but that the product itself was right; and others who believed that Laetrile is the best of the existing cancer fighters, and that the ultimate answer to cancer will be found in a number of approaches.
- Vitamin B_{17} was being demonstrated as effective in noncancerous maladies. Indeed, one case involving the apparent control of the hemolytic crisis of sickle-cell anemia was reported and researchers indicated that vitamin B_{17} might very well be a natural preventative against that deadly condition as well.

In the meantime, vitamin B_{17} was not the only unorthodox approach to cancer being investigated. Dr. Burk, while ardently devoted to the Laetrile cause, was reporting some very optimistic results with hydrazine sulfate. Albert Szent-Gyorgyi, who isolated vitamin C, was probing the electrical conducting capability of protein as key to the cancer mystery.

The possibilities concerning vitamin B_{17} are exciting, and are of enormous importance to a nation in which cancer is the second major natural cause of death. The answer to the riddle of cancer may very well have been found. It is exciting enough to consider the possibility that a major cancer weapon, perhaps the cancer weapon par excellence, is at hand. It is even more exciting

to contemplete the possibility that cancer may be susceptible of such natural, simple prevention that its importance will express itself with no more statistical impact than scurvy does today.

Surely, I learned, whatever the ultimate answer, the traditional wisdom in American medicine about cancer was, in 1974, woefully wrong. The American Cancer Society's own figures for 1974 showed that fifty-three million Americans now living will eventually have cancer—or one in four persons, according to present rates; that cancer will strike over the years in approximately two of three families; that in this decade there will be an estimated 6.5 million people under medical care for cancer.

The ACS predicted that in 1974 one million Americans would be under medical care for cancer, and about 655,000 new cases, *excluding* superficial skin cancer and carcinoma-in-situ of the uterine cervix, would be diagnosed for the first time. The society estimated that 355,000 would die of the disease in 1974—975 persons a day, one every one and one-half minutes.[8]

American medicine has admitted essentially low levels of survival rates for the multiplicity of disseminated cancers that afflict man, and researchers have demonstrated the toxicity of the orthodox chemotherapy and radiation approaches to cancer—some of which *do* and *have* worked. Despondent, some medical men are looking for new answers, and they are desperate enough to look into the realm of the unorthodox.

The following is my inquiry into the questions: Have the cause, control, and prevention of cancer been found? If so, why is medical and federal orthodoxy so determined to hide or thwart that reality?

8. *Cancer Facts & Figures*, American Cancer Society, New York, N.Y., 1974.

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From Death's Door: The Laetrile Recoveries

It was on July 27, 1972, that the *Berkeley Daily Gazette* was able to break the story that a fifty-five-year-old "terminal cancer" patient from Pinole, California, being operated on to reverse a colostomy, was discovered to have no sign of the dread disease at all.

The case of Dave Edmunds, a restaurateur, was intriguing to this newsman, then beginning a probe of Laetrile, for these reasons: The diagnosis of his cancer had been made in the United States by American doctors, his treatment had continued in the United States, and the cancer-free diagnosis was made in this country as well. The medication that Edmunds had been taking every day from December 1971 after refusing cobalt was Laetrile—literally provided on the sly.

The way in which he secured the Laetrile and how it was administered to him had to remain a secret; after all, a well-known Bay Area hospital was involved and well-credentialed doctors had treated him, even though the hospital and his operating surgeons were "innocent" of having had anything to do with his Laetrile treatment.

The amazing case of Edmunds began late in 1969, when he noticed that his weight dropped thirty pounds in two months. Two doctors gave him injections and pills, and a third ordered him to a hospital for tests, which revealed an intestinal tumor. Told he would die without surgery, the individualistic Edmunds turned to his own attempt at control through fruit juices. His weight went from 160 to 112 pounds. He was hospitalized in June 1971 and a large section of his bowel was removed. He was left with a colostomy, or temporary artificial anus. Months later he was hospitalized again and a marble-sized tumor was removed from his bladder. It became apparent that the cancer tissue was still in his body. The surgeons said further surgery would do no good and they suggested cobalt.

Having read about Laetrile, and feeling desperate, Edmunds and his wife

Josephine decided to turn—as, I later found, so many had turned—to Laetrile. He made contact through the "Laetrile underground," and began the treatment, beginning with three 3-gram injections every week and 1,500-milligram oral doses per day. By April 1972 injections were terminated and he continued only the daily doses of oral Laetrile. From the first use of Laetrile in December 1971, and through the time he was pronounced tumor-free, Edmunds insists he took no other treatment. He noted over the months that his general health began to improve—he gained weight, his appetite improved, his energy perked up, and he was suffering no side effects.

Before he was operated on for a third time, Edmunds stopped at a Richmond, California, hospital for an examination by the urologist. He recalls vividly the degree of excitement as the doctor, peering into his genitourinary areas in the uncomfortable way urologists do such things, could find no trace of malignancy. At another hospital, Edmunds was operated on by a doctor who said it would be a "waste of time" to reverse the colostomy if even a "trace" of cancer were found. No trace was found, and the operation occurred.

"They just don't understand it—they can't believe it, they think it's amazing," Edmunds elatedly told the *Gazette*. The Californian went on to become an outspoken defender of Laetrile, appearing in 1972 and 1973 at conferences and meetings as proof that an unorthodox approach to cancer had worked, at least in his case.

I later asked Edmunds on a television program if he thought during his unorthodox treatment that he had been "in the hands of kooks, cranks, and charlatans." He paused only momentarily before saying, "They were more like a band of angels."

Lorraine Clark, a Concord, California, housewife and an active Jehovah's Witness, was the first Laetrile patient I interviewed. Diagnosed and treated in Mexico, quite legally, by Dr. Ernesto Contreras, her case might well be poohpoohed by those who distrust the Tijuana approach. But, like Edmunds later, Mrs. Clark was convinced she owed her life to the banned substance and was always willing to say so.

She had first met Contreras when she took her father-in-law to see the Mexican medic. Frank Clark, also of Concord, was suffering from rectal cancer. Lorraine Clark had previously lost her parents and a brother to the disease, and now her father-in-law had been given three weeks to live by American doctors. Frank Clark underwent the Laetrile treatment and died eighteen months later, but of a heart attack. During that time, Mrs. Clark swears, the Laetrile seemed to bring his cancer under control.

Mrs. Clark, originally told in October 1966 that she had a tumor in the uterus cervix, was examined in Tijuana. Dr. Contreras used the urine test for cancer—denounced by American medicine—and informed her that she should start taking Laetrile capsules. She continued taking the little yellow pills during 1967, finally attaining two "negative" readings. In June 1968 she returned to Tijuana, where Contreras judged her tumors now to be nonmalignant. She underwent a hysterectomy and a "quart of tumor" was removed.

She told me that the operation, regarded by her American doctors as "excellent," had buoyed up her spirits. Too much. Because, now overconfident, she believed the problem was over. She went off Laetrile, and was doing all right for months until she started having abdominal pains. A loss of eighteen pounds in two weeks told her all she needed to know. "It was my own fault," she said. Back in Tijuana in October 1969, she began "massive injections" of the substance. Since that time, she believes, her cancer has been "controlled." She was still healthy and "controlled" in January 1974. The return of cancerous symptoms, she told me, indicated to her personal evidence of a key element of the Krebs theory—that Laetrile "controls" but does not "cure" cancer, as insulin controls but does not cure diabetes.

Why had she opted to take her father-in-law to Tijuana in the first place, I wanted to know. "I watched them cut my mother up piece by piece through three operations, a lot of misery and expense," she said.

Mrs. Clark was vehement in her denunciations of the American Medical Association, the FDA, and everyone else involved in making the proffering of Laetrile for cancer treatment a crime. Even though other American doctors were pleased to note her improved condition, "all they have to learn is that I went to Mexico for surgery and they look at me like a freak," she said.

It was within days of talking to Mrs. Clark that I met another outspoken Laetrile true believer, also in Concord: Mrs. Joan Wilkinson, a Denmark-born housewife and mother. In 1967, Mrs. Wilkinson said, she felt a growth in her left leg and also sensed "unusual heat" there. She had first been told there was nothing there, was then X-rayed and a growth was found on the bone. In her first U.S. operation, a tumor was removed from her leg. Two and a half months later she was back in the hospital with a malignancy necessitating the removal of muscle and bone.

Out of the hospital all was well for a time, but in 1968 she discovered a lump in the groin. Her doctor ordered a biopsy and she swiftly received the bad news: she had internal tumors of the lower abdomen, and she would need to undergo amputation of her left leg and hip and internal surgery. As Mrs. Wilkinson detailed it for *Prevention* magazine in December 1971:

> The surgeon, who also happened to be the head of the Cancer Society, took a book off a shelf and very cruelly told me what parts of the body would have to be removed. He traced the leg and organs with a pencil on an illustration of the human body.
>
> He also told me that before amputating he would do an exploratory of the lungs, and if he found cancer there, he would not amputate. As my husband put it, they would sew me up and send me home to die.
>
> It was a pretty bad time for us. I couldn't sleep. I started praying. Something told me—as if it were God Himself telling me—"this tragedy cannot happen to me." It was as if I were another person. . . .

The next morning, her sister, Mrs. Vera Murray of nearby Orinda, called her, literally pleading with her to see Dr. Ernst Krebs, Sr. in San Francisco. Then Mrs. Wilkinson remembered her sister had told her about Krebs and Laetrile the

year before, but she had forgotten. With the prospect of massive amputation and surgery facing her, and with the prediction of a probable six-week survival anyway, she decided she had nothing to lose.

Dr. Krebs, Sr., still practicing though in his eighties, started giving Mrs. Wilkinson large Laetrile injections. The tumor first grew in size, then began to recede—after five weeks of injections she could no longer feel it, she said. She continued 10cc. injections three times a week, accompanied by a special diet, one avoiding all dairy products and anything made with white flour. "And I felt wonderful!" the attractive housewife said. "In fact, in August 1969 the doctor told me I needed no more injections. My X rays were clear, showing that the tumor had shrunk, was apparently encased in scar tissue, and was not active."

When the surgeon under whose knife she had originally planned to go learned she would not be having surgery, he told her she had six to eight weeks to live—three months at the most—and even pleaded with her, she recalls. Since that time, five years before, Mrs. Wilkinson has been quite visibly healthy. When I interviewed her at her home, only some scar tissue in the left leg bore evidence of her brush-with-death ordeal. Her family doctor, she said, did not approve of her Laetrile treatment although "he says, 'I'm happy it worked for you.' " She told me she did not see Laetrile as a cure-all. But it had obviously worked in her case and she could not understand the campaign against it.

In a quiet apartment in Mountain View, California, a fifty-nine-year-old registered nurse relayed her own case history. In September 1970 a complaint of stomach problems caused Mrs. Grace Foley to have more than usual interest in her regular checkup. Her doctor made sure she was X-rayed, and then confirmed the worst: she had cancer covering about two thirds of her stomach. He advised chemotherapy.

In October and November she was treated with 5-Fu (fluorouracil). "I hadn't really felt bad before, but after every one of those 5-Fu shots I felt so bad. I had to do something," she recalled.

Through a friend of a friend, she learned about Laetrile, and about Dr. Contreras' clinic in Tijuana. "So I up and said, 'I'm going to Mexico.' My oncologist got mad at me, but he did say he had never heard of Laetrile hurting anyone."

Feeling quite sick, Mrs. Foley made her first trip to visit Dr. Contreras in February 1971, and received intravenous injections for ten days along with other treatments, including pancreatic enzymes. "The reactions were amazing. Even my eyes got better. My husband couldn't believe it," she said.

Back home in San Carlos, where she formerly lived, she continued with Laetrile and the special diet, returning every two to three months to see Contreras. When she was back in Tijuana on March 31, 1972, for surgery on an intestinal obstruction, Contreras was "ecstatic," she said, to note that there were no visible signs of cancer. She returned home and remained on Laetrile. All was going well, she recalled, until her husband died (August 1972). She then entered an emotionally severe period of her life.

"In January of 1973 all of a sudden I had abdominal problems again. I went

to see Dr. Contreras on January 8 and had X rays taken there. He was very disturbed by those X rays." They revealed a return of the cancer she had earlier thought under control. She underwent surgery January 19, 1973, and remained in the hospital for two weeks. "They found my whole intestine filled with cancer. Contreras didn't think I was long for this world. And, I had developed a fistula."

Mrs. Foley was put on considerable doses of Laetrile—nine grams a day—and continued this treatment daily in her apartment with the aid of a nurse. "The local doctors said it was the beginning of the end," she remembered.

Ernst Krebs, Jr., with whom she had been in touch, referred her to Dr. Richardson, the Albany, California, physician already in the toils of the law for having been convicted of using Laetrile in his treatment of cancer patients. She went into a Bay Area hospital in February 1973 for abdominal surgery related to the fistula problem and following less than a month of large daily doses of intravenous Laetrile. The surgery was a complicated five-hour effort—but what had been massive cancer a month before was now "just a little bit." The surgeon who performed the operation was impressed, but maintained his disbelief in the effectiveness of Laetrile.

Following the surgery, Mrs. Foley remained on intravenous Laetrile and reverted to oral doses as her weight increased from 95 to 115 pounds. When I interviewed her in July 1973, she was convinced her long battle with cancer was at least under control.

As in the following two cases, Mrs. Foley, a terminal cancer patient, expired while this book was in progress. Yet in her case as in the other two, longevity of life considerably beyond what orthodox medicine had hoped for her, reduction of pain and-or other pathological symptoms, or all of these, paralleled treatment with Laetrile. For again the great majority of patients do not turn to the outlawed substance until it is too late, and Laetrile's backers have never claimed it is a miracle drug.

Mrs. Foley's case, one in which cancer recurs even under well-watched Laetrile therapy—a point strongly made by Dr. Contreras—was one of the cases involving Dr. Richardson, as the California physician continued treating hundreds of patients with Laetrile even while undergoing the rigors of three court trials on "cancer quackery" charges. His earlier convictions on Laetrile charges overturned at the superior court appellate division level and a new trial ordered, Dr. Richardson openly admitted (in August 1973) that he was still using Laetrile. But he added that Laetrile, or vitamin B_{17}, was being dispensed only as part of the total "megavitamin therapy" he was providing all his patients. This was in accord with one of the technicalities of the reversal of the original charges against him—namely, that there is nothing illegal in California in providing amygdalin in metabolic therapy.

By that time, several doctors in the United States were using Laetrile in cancer therapy, despite the clamps imposed by the FDA and state health authorities. Hundreds of doctors either used or were aware of Laetrile, but chose to keep quiet about it at the public level.

By word of mouth and the rapidly advancing Committee for Freedom of

Choice in Cancer Therapy, terminal cancer patients were coming to California and visiting Dr. Richardson in his clinic, but many more continued to go to Mexico where Dr. Contreras and an expanded staff were treating increasing numbers of cancer patients, mostly Americans, quite legally. Two of the Richardson cases I interviewed in 1973 are, like the Foley one, particularly noteworthy, for they demonstrated response, or seeming response, to massive Laetrile treatment and clearly opposed the best orthodox medical thinking of seasoned medical men, even though, in both cases, death finally ensued. In each case life had been prolonged, pain reduced, and temporary, dramatic improvement noted. In two of the three cases noted here, Dr. Richardson pointed out, death was due to complications rather than to the cancer itself. And in both of these the patients had been subjected to toxic traditional therapy before turning to Laetrile.

An Illinois woman, Mrs. Julius Butler, had been diagnosed as having cancer in 1970 and had undergone a complete hysterectomy. In August 1971 she began to notice back pains. She was informed that her cancer was back, and she began taking cobalt treatments, which continued through 1971, 1972, and part of 1973. Those close to her used terms like "cooked" and "dehydrated" to describe the fifty-nine-year-old Mrs. Butler's condition after intensive cobalt therapy.

In and out of the hospital with a deteriorating condition, she was finally given up by the doctors. "They said nothing more could be done for her, that an operation would kill her," Julius Butler recalled. By this time, she was down to seventy-five pounds and was suffering from adhesions and bowel obstructions. She was taking morphine every two hours. Her digestive system was almost entirely inoperative and she was clearly at death's door.

Julius Butler heard of Laetrile, and had heard of Dr. Richardson. He told his doctors about it and they said that although it could not legally be procured in Illinois, they would "look into it"—a process which took ten days as the life of Opal Butler, racked by cancer and cobalt, continued to ebb. Then Mrs. Butler received a legal opinion from a hospital attorney: no dice. Laetrile could not be used in any way by that hospital, since reputation, let alone license, was at stake. "I was told to give up all hope," Mr. Butler told me. Doctors could only offer an experimental new legal drug, but aside from that actually suggested that "she be allowed to slip away," he said.

Mr. Butler contacted Dr. Richardson and made the arrangements whereby his extremely critical wife could be flown in a stretcher from Chicago to San Francisco. This was done in June 1973. Opposing the earlier advice against operating on her, Dr. Richardson ordered surgery for her bowel obstructions and adhesions, thus restoring the digestive tract to something like normal. She was placed immediately on daily intravenous Laetrile injections. She spent two and a half weeks in the hospital. Released July 13, she was recuperating in a Berkeley motel when I first talked to her. "If you think I look like death warmed over now, you should have seen me when I got here to the Bay Area," she said with a smile and very weak voice.

Under the constant care of nurses, Mrs. Butler was eating more, regaining

weight, and, most important, *no longer felt any pain,* and was off morphine. This condition persisted for months—dramatic evidence that somehow something was right with Laetrile. Abandoned by competent and qualified physicians as a terminal cancer patient, she was out of pain and seemingly recovering in Berkeley. Time had been bought, and I had to shake my head once again: was this just another coincidence? That Mrs. Butler ultimately died—not, as Dr. Richardson pointed out, of cancer, but of other complications—hardly detracted from the strong likelihood that she had received considerable benefit from the "worthless apricot-pit cancer cure."

In the same motel, which I came to call the "Laetrile Towers," was another dramatic Richardson patient—the combative seventy-year-old head of the New England Rally for God, Family and Country. Mrs. Anna McKinney, the mother of nine and wife of a physician, had been told in Boston in February 1973, she said, that "nothing could be done" for her bladder and intestinal cancer. "I was told I had less than a year to live," she recalled. In fact, she survived until summer 1974.

She visited Dr. Richardson in March and for eighteen days took 3cc. daily of Laetrile. After two months of treatment, she returned to New England, where a urologist who examined her was "amazed" at the regression of symptoms. "I felt better, but not well," she said. Even so, her family doctor was impressed at her general condition.

Back under Richardson's care in August, almost seven months following her gloomy diagnosis, she felt "one thousand percent better," she asserted. "My doctor still can't believe it. When I saw him back home, he asked me, 'Are you going to give credit to Laetrile, or to God?' I of course answered, 'To God.' "

The devoutly religious Mrs. McKinney had touched on a point that I had heard emphasized before, and which I can only consider a variable in certain cancer-"control" cases: pure faith. Mrs. Butler, Mrs. Clark, Mrs. Foley, and Mrs. McKinney all emphasized in their interviews virtually unswerving religious faith. Mrs. Foley, a self-described "very religious Catholic," one of whose children married an Orthodox Jew and who had numerous religious Protestant friends, said she asked them all to pray for her, and is convinced that prayer was vital to her recovery. Mrs. McKinney described "a kind of euphoria" upon learning that she was a terminal patient, a feeling that gave her particular joy in living each day at a time, she said.

There had been some other fairly spectacular examples of Laetrile use that I came to know about in the Bay Area. A Pinole woman whose sister had died in 1964 after forty-three X-ray treatments had decided that if she ever had cancer she would go see Dr. Krebs Sr. She developed rectal cancer and began receiving intramuscular injections of three grams three times a week beginning in 1969. The pain left her and the lump diminished. She went without Laetrile for five weeks following the senior Krebs's retirement. The pain returned, excruciatingly, and she went to see Dr. Contreras in Tijuana. There she resumed Laetrile injections, taking nine grams a week for ten months. By June 1973 she said the limp her pain had caused had gone in six weeks, her strength had gradually re-

turned and she went back to work as an Oakland seamstress. As of the summer of 1973 she was down to a single injection of three grams once a week.

A sixty-five-year-old San Pablo man, given to understand "I wouldn't last too long," was diagnosed in 1968 as having cancer of the prostate. He became a Krebs Sr. patient. His soap-sized tumor was treated throughout 1969 with Laetrile injections every four days and he adhered to a strict diet. He had refused cobalt treatment during surgery of the urethra, and made considerable progress.

A thirty-one-year-old San Rafael widow who underwent sixty cobalt treatments in two months and was hospitalized "ten or twelve" times for treatment of Hodgkins disease before hearing about Laetrile, visited Contreras in Tijuana in February 1972. Though the kindly medic held out no hope, she wanted treatment and got it—to the tune of 1,500 milligrams a day. She told *Let's Live* magazine in June 1973 that within a week her pain had subsided and she was "looking better."

At the same time, San Francisco insurance man Jay M. Hutchinson, founder of the Test Laetrile Now Committee, reported "control" of lymphosarcoma—fourth-stage terminal cancer—through Laetrile, enzymes, and a special diet. Hutchinson is himself a dramatic case. He recalled that his doctors called him a "walking malignancy." Initial tests had revealed cancer spread uniformly throughout his lymph system and bone marrow. Kaiser Hospital doctors said it would not respond to irradiation and recommended a combination of chemotherapy treatments, which they acknowledged could cause loss of hair, bone marrow depression, destruction of red blood corpuscles, and nausea.

After Hutchinson's employer told him of a cousin who had become a Laetrile patient under Dr. Ernesto Contreras seven years before and how his face, disfigured after several surgeries for melanoma, had healed in three months, Hutchinson was on the plane for Tijuana. For three weeks he received intravenous Laetrile injections in three-gram doses. Back in San Francisco, he began an oral dosage of one and a half grams per day. This he continued for two months. From the third month on he took a gram of Laetrile a day.

As he told *Let's Live* and confirmed to me personally, "Laetrile is the only thing I've taken, and I've had a year completely free from ailment.

"I can't say Laetrile has produced the stabilized condition. All I can say is I am stabilized—it may be the diet, or a combination of both. There have been no further symptoms.

"I have seen Dr. Contreras five times, and continue seeing my Kaiser physicians. Their medical reports contain the data on my Laetrile intake. The swelling is still there, but no larger. Sometimes it goes down to half-size for a while. There is no pain or discomfort." In 1974 he had had almost three years free of disease.

In 1973-74 the dam was bursting on "known" Laetrile and amygdalin therapy cases in the United States. Dr. John A. Richardson said he had treated 750 patients with Laetrile as part of his basic megavitamin therapy. In all cases palliation, ranging from minimal and temporary to considerable and long-term, occurred, he said.

Dr. Lawrence McDonald of Atlanta, Georgia, who had been a convinced skeptic but who became more convinced about Laetrile efficacy after attending a Laetrile seminar in San Francisco in January 1973, testified in Dr. Richardson's behalf that he had treated eighty patients in Atlanta and had suffered no legal consequences since Georgia has no specific statutes barring use of Laetrile. In the McDonald cases, the results were about the same.

At the Richardson trials I met several dozen more cancer "controllees"—members and supporters of the Committee for Freedom of Choice in Cancer Therapy, and all of them prior or ongoing patients of Dr. Hans Nieper in West Germany, Dr. Ernesto Contreras in Tijuana, or Dr. Richardson in California. Their testimonials spanned the range too, with the most dramatic being those in which victims facing massive surgery and told they were terminal declared dramatic regression of symptoms.

A Millbrae, California, grandmother reported on a controlled leukemia case, that of her four-year-old grandson, in a letter to Sloan-Kettering's Dr. Kanematsu Sugiura, who was conducting the Laetrile tests at the prestigious institute in 1973 and 1974. Mrs. Lynn Conragan wrote, December 13, 1973, in part:

> Kindly note copy of the enclosed letter (hospital analysis of her grandson done July 15, 1970). The child in question is my grandson who will be four years old in three weeks and is the picture of health. Yet we were told, when he was three months of age, that he would live only at the most an additional 30 days!
>
> Shaun, my grandson, was born with leukemia—yet the physicians treated my daughter like another hysterical new mother when she tried to tell them the first three months of his life that the child was ill and not responding normally to food, etc. . . .
>
> We physically took this child out of the hospital over the attending physicians' protests and, knowing we had nothing to lose, started him immediately on Laetrile and 500 mg. daily of every high-powered vitamin that we could get into him, such as C, E, Wheat Germ, enzymes, etc. . . .
>
> My grandson has had no chemotherapy since he was 10 months of age and no irradiation therapy to the spleen since 3 months of age. . . .
>
> My only despair is the thought of all the infants I saw in the hospital with the same disease, at the same time as Shaun, who were experimented upon by well-meaning physicians, but are now dead because the medical profession itself is still in a self-imposed darkness.[1]

And Marcia Laurence, San Carlos, California, wrote Sloan-Kettering's Dr. Lloyd Old on July 15, 1973, concerning her amazing case treated by Dr. Nieper:

> I am writing at the behest of Dr. Hans Nieper of Hannover, Germany, to whom I went for cancer therapy in February of this year. I am overjoyed that someone of your stature in American cancer investigation might be interested in my case history, because it is my firm belief that Dr. Nieper's therapy saved my life. I believe, likewise, that countless other lives could be saved if the same

1. Letter made available to the author.

therapy were recognized and practiced in the United States. . . .

Approximately 8 years ago I discovered a lump in my right breast which was diagnosed as carcinoma and which was excised by a radical mastectomy. Three months later I submitted to a single mastectomy of the left breast upon the recommendation of the cancer board of the hospital which was based on the history of breast cancer on both sides of my family, my young age (35), the significant incidence of transference of tumor from one breast to the other, and the fact that my tumor, unlike the majority, appeared in the right breast. I had had my uterus removed after my last C Section, but no oophorectomy was recommended. I recovered and had no trouble of this nature for 7 years.

In May of 1972 I had an anterior spinal fusion at C-5, C-6. Following this, my neck pain at first subsided and then began to build in intensity until I had to be readmitted to the hospital. X-rays revealed lesions involving vertebrae C-2 through C-5. I was sent to Stanford to begin radiation on the Linear Accelerator and to have an oophorectomy.

I had maximum radiation to my entire spine, and, because my neck was in such bad shape, I needed to roll in bed from my back to my side for several weeks. Shortly after starting radiation, an oophorectomy was performed.

At the end of July I was discharged to continue my recuperation at home and continue radiation as an out-patient. Although I was free of neck pain, I could not hold my head up for very long as my neck was too weak to support it. Also, I was so debilitated that the most simple actions became major efforts most of which I did not have the stamina to perform. I need to interject here that when the oophorectomy was performed, it was found that the peritoneum was studded with tumor. There were nodules on the right ovary and over the liver.

In January, 1973, pain erupted in my right upper arm and X-rays revealed tumor in the humerus. I was sent immediately into radiation (4,000 rads). The surgical department then began talking seriously about an adrenalectomy, while the radiation department recommended chemotherapy, the time to start being discretionary with the surgical department.

It was at this point that my husband and I drew a halt to the proceedings. From Dr. Victor Richards' book *The Wayward Cell* we had learned that the prognoses for the American cancer therapies for metastases [were] very far from encouraging. We also read a quote of Dr. Frank Rauscher Jr. that only about 7½ percent of all human cancers of [metastatic] nature can be brought to the status of 5-year survival. When I asked one of my doctors at Stanford for my prognosis, he simply told me to live one day at a time. My body had deteriorated to such an extent that I arranged to leave my body to the University and my eyes to the Eye Bank. I still wore my cervical collar 75 percent of the time, spinal pressure somewhere kept my right hand perpetually tingly and numb, and I wore my right arm in a sling, although I had been warned that because the humerus was so thin my arm would, in all likelihood, fracture spontaneously.

We had heard Dr. Dean Burk speak of Laetrile over television. We heard more in-depth discussion of it at a symposium of the International Assn. of Cancer Victims and Friends which we attended as members.

After questioning several members and doctors there, including Dr. Burk, we decided to see Dr. Nieper in Germany. At this time we had little real faith that the progress of my metastases might be stopped; we simply felt that we must look outside the United States for assistance in bringing me to a state of some health so that whatever survival time I had remaining might be spent in as near normal a way as was possible.

In the United States cancer therapy consists of cutting, burning or poisoning. I did not feel I could afford to be decimated further as already each

day for me was something of an ordeal.

In February, I flew over to see Dr. Nieper. When I left, I was wearing my collar, my sling, and I had to be transported to the plane in a wheel chair as I was too weak to walk the distance required. I saw the doctor on weekdays for slightly less than three weeks, and my husband and I took another four weeks coming home at a leisurely pace.

By the time I arrived home, I was not only strongly walking long distances without tiring, I was carrying my own luggage without difficulty, and I felt in better health than I had felt in *at least* ten years!

While I was with the doctor, extremely severe pain in my right side indicated the presence of metastasis (which, had I been in this country, would have sent me into radiation forthwith). Dr. Nieper told me it was something I should disregard for the present; the pain was severe for about a week, it was at a fairly tolerable level for another week, by the third week the pain was only spasmodic, and thereafter I forgot I'd had it.

X-rays taken upon my return to Stanford revealed metastases in right ribs 10 and 11 but the condition appeared to be stabilized and the absence of pain dictated against radiation therapy. Another test indicated the absence of metastasis in my liver. My examination at Stanford revealed me to be in good shape with relation to the cancer, and it was noted that my "general feeling of well being is outstanding."[2]

Mrs. Laurence detailed the Nieper treatment, which the West German medic relayed via a tape recording for her stateside doctors. The specific cancer-cell destroyer prescribed was amygdalin. He also prescribed numerous other medications for metabolic therapy, bone recalcification, and other processes, as well as a strict diet.

The amazing Laurence case was not over when this book went to press. She still reported a bone-cancer problem. But to her, and to so many others, the success of amygdalin therapy was her tremendous reduction in pain and suffering and the restoration of a sense of well-being. Too, she was obviously surviving longer than American medicine would have predicted.

Again and again I was learning of palliation from amygdalin (or Laetrile-nitriloside-vitamin B_{17}) therapy. Simply if such therapy provided nothing more than relief from pain, why, *why* did it remain illegal for use in cancer therapy?

When interviewing the Laetrile patients, hearing about Laetrile cases, perusing the earlier information on Laetrile and amygdalin, it seemed to me a pattern was forming, one not susceptible of an offhand putdown by governmental decree. Laetrile obviously was having some effect, if only minimal in some cases. In others, it was clearly associated with spectacular effects. No one in the front rank of the Laetrile movement—not Ernst Krebs, Jr., not Dr. Contreras, not Andrew McNaughton, not Dean Burk—was talking about the infallibility of Laetrile. There were dead Laetrile patients as well as live ones. No one talked cure; the most I ever heard in terms of claims was the word "control." No doctor involved in the Laetrile story was claiming vitamin B_{17} was the last, final word. And even Krebs, while wholeheartedly dedicated

2. Letter made available to the author.

to the unitarian trophoblastic theory of cancer, continually stressed the substance did one thing and one thing only in cancer therapy: it inhibited cancer tumors. It could not restore destroyed tissues.

Laetrile remained hard to get, unless one knew of the Laetrile underground and the foreign treatments. In the summer of 1972, for example, a sixty-four-year-old semiretired Philadelphia construction worker broke into the laboratory of Ernst Krebs, Jr. in San Francisco, looking for Laetrile—and finding none. He had heard about it, and had heard about Krebs. The man, Jack Hanley, turned himself into police as the "burglar," stating he needed the compound to help control his lung cancer, and could not get it in the East. "I wanted it, I needed it, and I came here from Philadelphia to get it," was the way Hanley explained it to me. The junior Krebs refused to prefer charges. "The real criminals are those in government who deprive people of what they need," he said.

3

The Battle of Unorthodoxy: Enter John Beard

There is nothing new about challenges to scientific orthodoxy, challenges which shake the very foundations of conventional wisdom. Indeed, the history of scientific breakthroughs is one of repeated unorthodox challenges to orthodox articles of faith. Laetrile, or vitamin B_{17}, is only one in a series of such challenges, and without a doubt is the most serious challenge to orthodox thinking about cancer.

The frontiers of science are peopled by those with an unorthodox approach. Copernicus and Galileo had the brassbound gall to assert that a round world went around the sun, hence flying in the face of conventional wisdom and mightily ruffling the feathers of the theological-scientific establishment of their day. Sir Alexander Fleming once noted that penicillin stayed on the shelf for years while orthodox medicine condemned him as a quack, a deceiver of the public.

Medical orthodoxy has played key roles in history; for centuries, for example, "bleeding" was the standard treatment for a host of conditions. George Washington was bled four times in a twelve-hour period for treatment of a cold. The very weakened father of his country was then administered calomel and huge doses of tartar emetic. Moreover, pulverized beetles were put around his neck to raise blisters. Everything failed and he died of pneumonia.

Perhaps the most widely reported death of a monarch—and the most vivid descriptions of orthodox medical practice in the seventeenth century—is the passing of King Charles II of England; eight detailed versions of his demise are extant and come from the pens of doctors and other witnesses. That the well-meaning attending physicians helped speed the death of the monarch is, with the security of hindsight, beyond a reasonable doubt. What they did to poor Charles!

Sir Charles Scarburgh, Charles II's personal physician, informs us that on

February 2, 1685, the monarch suddenly suffered a loss of speech and convulsions.[1] Immediately two physicians drew out sixteen ounces of blood from his right arm, applied cupping glasses to his shoulders and "scarification deep enough to effect a fuller and more vigorous revulsion," thereby drawing off an additional eight ounces of blood. To free his stomach and system from "impurities," the physicians next administered an emetic consisting of "orange infusion of the metals, made in white wine," white vitriol, and peony water. This was followed by an enema made of powder of sacred bitters, syrup of buckthorn, rock salt, and more of the orange infusion of metals. "Above and beyond this, so as to leave no stone unturned, blistering agents were applied all over his head, after his hair had been shaved."

Special preparations followed "to give strength to his loaded brain" sacred bitters powder, peony water, bryony compound) and to "excite sneezing," with powder of white hellebore roots "to be applied to the King's nostrils as occasion arose." A second brain strengthener (four ounces of cowslip flowers) was added, as were a preparation (manna, barley water, cream of tartar) to "keep his bowels active at night" and an emulsion of barley, licorice, and sweet almond kernels to "counteract the scalding of his urine, likely to result from the use of blistering drugs."

While these remedies and broths were fed, "spirit of sal ammoniac was applied now and again to His Most Serene Majesty's nostrils" along with another substance, and "cephalic plasters combined with spurge and burgundy pitch, in equal parts, were applied to the soles of his feet."

These same general procedures continued on February 3, with an additional ten ounces of blood removed from his jugular vein and a new emulsion to counteract scalding of the urine administered. The king now complained of a sore throat and for this a special mixture for gargling consisting of inner bark of elm, barley water, and syrup of mallow was provided. A julep of various sweeteners was then prescribed.

On February 4 a "mild laxative" consisting of white tartar, white wine, senna leaves, manna, flowers of chamomile, gentian root, and nutmeg was administered. These remedies failed to do the trick, and Scarburgh notes that "as His Serene Majesty's condition became most grave as the night advanced, the physicians who were watching him considered it advisable to administer the following small draught—B. spirit of human skull, 40 drops."

On February 5, to counteract a fever, the body of physicians provided Peruvian bark, antidotal milk water, and syrup of cloves. They continued using extract of human skull in a "pearl julep." Yet on February 6, "as the illness was now becoming more grave and His Most Serene Majesty's strength (Woe's me!) gradually failing, the physicians were compelled to have recourse to the more active cardiac tonics, and to prescribe the following . . . Raleigh's stronger antidote," an essence of dissolved pearl, and goa stone. A host of remedies followed during the day, including more sal ammoniac and bezoar stones from animal intestines. All of these measures failed

1. Raymond Crawfurd, *The Last Days of Charles II* (Oxford: Clarendon Press, 1909).

to alleviate the royal personage and at length he expired.

Raymond Crawfurd, having researched the illness and treatment of Charles II, concludes that actually the malady was a form of Bright's disease and that the misuse of the blistering agents—Spanish fly, or cantharides—proved fatal, robbing the kidneys of their last vestige of functional activity. The point here is that the best medical thinking of the century was marshaled in defense of Charles II's last hours. That thinking simply did not work.

In the matter of cancer in the twentieth century, orthodox medicine is faced with a severe challenge: the disease, in any of its officially cited 100 basic forms (or its varying 200—or even more—forms), has reached epidemic dimensions in the Western world and in most technological and industrialized countries elsewhere. By 1973 the death rate from cancer was accelerating at the fastest pace in twenty-two years, according to the American Cancer Society.

The orthodox approach to cancer was and is X rays, radioactive substances, and various chemotherapeutic substances and hormones. As we discuss elsewhere, these methods are so marginally effective that no optimistic assault on cancer incidence and death-rate statistics has been made.

At some point, governmental power and medical practice began to fuse in this country, so much so, indeed, that by "medical establishment" one tended to mean the points of view of the powerful American Medical Association and the enforcing, enabling capacities of the Food and Drug Administration. Persons who tended to run afoul of the scientific biases and conventional wisdom of the AMA usually found themselves in hot water with state departments of public health and the FDA.

In fact, unorthodox researchers and scientists, and in general nutritional experts who believe much of established medicine in America is based on unnatural (that is, drug) approaches to prevention and treatment rather than on natural ones (food, nutrition, etc.), have denounced the medical establishment with such terms as "medical politicians" and spoken of a medical-governmental-pharmaceutical monopoly somehow intent on peddling pills and expensive drugs to an American public getting progressively sicker.

In the area of cancer, researchers who deviated from conventional wisdom—and little wisdom about the complex of diseases called cancer can actually be described as conventional—were vigorously harassed by the medical profession and established law. We are not here jumping to conclusions as to the efficacy or lack thereof of unorthodox or "unproven" methods of cancer treatment, but we refer to them in passing. Dr. William F. Koch, whose "glyoxylide" was the first of the great alleged cancer combatants dismissed and pursued as quackery, fought medical orthodoxy and government bureaucracy for more than two decades in the United States, and eventually left—or was "driven from" (as some insist)—the country. Backers of the glyoxylide approach to cancer at one time claimed 2,000 medical osteopaths and naturopaths, who pointed to certain benefits from its use.

Dr. Andrew Ivy, another respected scientist, underwent nine months of criminal prosecution after endorsing "krebiozen," a cancer treatment of-

ficially branded as worthless by the medical-governmental establishment but valiantly defended by some individuals to the present day. Dr. Ivy was acquitted, but krebiozen, like glyoxylide, remains suppressed. Both were "news" during a period of time overlapping with the development and pioneering of Laetrile.[2]

Laetrile remains the vintage unorthodox approach to cancer, with by far the greatest amount of favorable literature and qualified scientific research, and with thousands of testimonial case histories behind it. By this decade it had also become an ideological football, and the Laetrile War was fully raging as this was written.

It is not the intent or scope of this book to make a case for presumptive conspiracy theories about medicine, pharmacy, and bureaucracy. The John Birch Society members battling within the Laetrile movement—again, as individuals, not as Birchers executing orders from the society that, as an organization, took no stand on the matter—are doing sufficient in that regard. Such Birch-allied writers as Ed Griffin have done yeoman work in describing the "politics of cancer" and have linked the same to overall Birch views on governmental conspiracy. Others have used the Birch presence in the Laetrile issue to belittle the whole matter, but that presence has raised relevant questions.

How vested interests, ego concerns, and simple economics and politics might merge to muddy the already befouled waters about cancer—its control, cure, and prevention—is an ever-recurring question that admits of no single answer. And the Birchers, arriving late in the Laetrile story, were by no means the first to raise it.

Morris A. Bealle, who wrote on medical and pharmaceutical matters, was perhaps one of the most informed and outspoken observers of what he called the "drug trust," an interlocking web of pharmaceutical houses which in turn is said to overlap with established medicine and governmental agencies. He detailed "the largest drug manufacturing combine in the world," which he attributed to Eastern interests, and charged that the combine uses all its other interests "to bring pressure to continue and increase the sale of drugs."[3]

In *Super Drug Story* he also insisted that "not only does the F&DA wink at violations by the Drug Trust . . . but it is very assiduous in putting out of business any and all vendors of therapeutic devices which increase the health incidence of the public and thus decrease the profit incidence of the Drug Trust" (p. 35). The bureau "is used primarily for the perversion of justice by 'cracking down' on all who endanger the profits of the Drug Trust" (p. 34), he adds, claiming that the alleged trust sees vitamins as a key threat to profits, and argues that the American Medical Association is little more than a

2. To say nothing of the controversy surrounding the Hoxsey treatment, an herbal elixir distributed from Mexico.

3. Morris A. Bealle, *Super Drug Story* (Washington: Columbia Publishing Co., 1962).

"powerful subsidiary of the Drug Trust" (p. 65). He quotes Dr. Emanuel M. Josephson (p. 63):

> "Associations have been formed to 'control cancer.' They have been more successful in controlling the cancer business. If they incidentally increase the financial returns on their doctors' investments in radium—it must be said that the price of radium increased 1,000 percent when they began to use it on cancer victims—that was hardly unexpected or undesired.
>
> "These doctors proclaim themselves 'authorities' and 'specialists' in cancer. They systematically deny everything that does not emanate from themselves and add to their cash incomes. Since these fakers would be 'robbed' of their livelihoods and incomes by any effective means of preventing cancer, they can be depended on to promptly reject any method which might be discovered. As 'omniscient authorities' they vehemently scorn and discredit any such possibility. They happily insist that the cancer problem will be with us forever.
>
> "Cancer associations do not use the funds they collect for the relief of cancer victims or for the payment of institutions for their care. The money collected has been used for the payment of salaries to the medical bosses, to other personnel and for publicity, propaganda and advertising [for more contributions]."

Strong stuff, important allegations these, and paralleling the Birch view, at least in part. The latter assessment, that medical-governmental orthodoxy is but a reflection of a graver problem, was expounded by Alan Stang in the Birch monthly magazine, *American Opinion*, of January 1974:

> It is important not to blame doctors as a group for the underhanded campaign against Laetrile. Most doctors deserve the great respect they are paid. Rather, bureaucrats and key members of the medical establishment are responsible, and they are trying to prevent curious physicians from learning more. They are trying to keep them in line, just as the Establishment as a whole is trying to keep the American people in line.[4]

Such activities as the arrest of Dr. John Richardson in California, the seizure of Laetrile smugglers on the Mexican border, and the feverish attacks against Laetrile and its developers and defenders in "establishment" journals only fed the conspiracy feelings of a growing segment of Laetrile true-believers. The FDA attempts at far greater restriction on over-the-counter sales of vitamins and minerals (originally ordered for January 1, 1974, but blocked at least temporarily by court action), the FDA move against Laetrilelike products in 1973 and 1974, and state health department warnings about apricot-pit consumption all played their roles in seemingly justifying such fears about Laetrile and the government.

The Laetrile story begins early in human history, and throughout it is studded with ironies and coincidences, the stuff that makes truth stranger than fiction. Among the more fascinating coincidences is the name of the substance itself, particularly so when compared to the name of a remedy first reported in

4. Alan Stang, "Laetrile: Freedom of Choice in Cancer Therapy?" *American Opinion*, January 1974.

1813—a kind of elixir that, among many other things, was said to cure breast cancer. The product was called Leotrill, and as far as we know it is mentioned only and exclusively in something called *The Indian Doctor's Dispensatory*, published in Cincinnati in 1813 and "being Father Smith's advice respecting diseases and their cure."[5] The author writes:

> About thirty years ago I called on old Dr. Wilkey, a German, who had been in the business of his profession, in the Flanders wars. He proposed to me to spend a few days with him, to instruct me in some knowledge which he had gained in his long life, and which he regretted should die with him: especially to make his *Leotrill*, a liquid which he prepared; for the obtaining of which he had paid a large sum in Flanders.
>
> With this medicine he made many of his cures, both in physic and surgery. With this, said he, "I can put a person in a complete salivation in ten minutes. I need only throw this with a syringe into any sore, ulcer, or wound, and it is fit at once for healing . . . and a cancer in a woman's breast, I have never failed to cure with it."

We will never know what went into this elixir. The Laetrile developers had never heard of this particular folk remedy, and had no notion about whether it had anything to do with Laetrile—the name Ernst Krebs, Jr. wrought out of the scientific description of his specific compound: LAEvo-mandeloniTRILE.

For the laetrilists, the natural approach to cancer must have been known about in ancient China, where substances of the family of which Laetrile is really only a brand name were used medically. And, as researcher Herbert M. Summa points out, the Egyptians in the time of the pharaohs knew the poisonous action of consuming large amounts of apricot and bitter almond kernels containing the same substance (amygdalin), of which Laetrile, again, is a brand name (now in the public domain).[6]

According to Summa, the Egyptians forced people condemned to death to drink a concoction made of such kernels with water. The "apricot death," similar to a Greek process, was based on the spontaneous setting free of hydrogen cyanide from amygdalin in the intestines by the enzyme emulsin. That cyanide is part of the amygdalin process—however perfectly natural this is in life itself—has been a specter that has haunted Laetrile from the beginning, for it has been easy for orthodoxy to concentrate on the word "cyanide" and forget that the same cyanide-containing substances have been associated with medication. Modern research (including that of Summa) has emphasized time and time again the essential nontoxicity of the purified, crystallized, extracted amygdalin called Laetrile. The referred-to Egyptian and Greek potions released "unphysiological quantities of hydrocyanic acid [which were] absolutely lethal, when liberated by enzymatic activity from a specific substrate under ideal conditions," Summa notes.

The Roman medicinal preparation called Aqua Amygdalarum Amarum

5. Quoted in Adelaide Hechtlinger, *The Great Patent Medicine Era* (New York: Grosset & Dunlap, 1970).

6. Herbert M. Summa, "Amygdalin: A Physiologically Active Therapeutic Agent in Malignancies," *Krebsgeschehen* 4 (1972). (Translated from the German.)

was made from a watery emulsion of bitter almonds. This "bitter almond water" continued as a medicine known for centuries, with amygdalin supplying its source until replaced by a synthetic benzaldehyde. Bitter almonds are a primary source of amygdalin, the chemical or generic name for what later became Laetrile—a processed, purified form of the natural substance.

It is here that we should clarify some terms, since products and substances, some involving manufactured words, have been used to describe what is essentially the same thing. The name "Laetrile" (and also "laetrile") is used to refer to:

- The present injectable form of amygdalin and the extract put up in tablet form.
- A whole class of substances in nature, scientifically and variously referred to as beta-cyanophoric glycosides, beta-cyanogenetic glucosides, and similar designations; and, more specifically, to amygdalin and prunasin, the two beta-cyanogenetic glucosides of most medical interest.
- Vitamin B_{17}, a designation created by Ernst T. Krebs, Jr. The McNaughton Foundation, sponsor of Laetrile research around the world, uses the designation exclusively to describe amygdalin, though Krebs broadly applies it to the beta-cyanogenetic glucosides. His term of choice for this class of substances, also coined by him, is "nitriloside."

Krebs Jr. has defined the nitrilosides as "water-soluble, essentially nontoxic, sugary compounds found in . . . plants, many of which are edible. . . . They comprise molecules made of a sugar, hydrogen cyanide, a benzene ring or an acetone."[7] The general designation "Laetrile" thus broadly covers amygdalin, prunasin, vitamin B_{17}, nitriloside, beta-cyanogenetic glucosides, beta-cyanophoric glycosides, etc. The differences mean little since all the products are essentially (but by no means specifically) the same thing when broken down in water. Amygdalin is the common chemical term occurring in the history of the substance. The latter, occurring in a wide variety of kernels and seeds, was prepared in its pure state by Pierre Jean Robiquet and Boutron in 1830. In 1837 two German scientists, Justus von Liebig and Friedrich Wohler, discovered that amygdalin is split by an enzyme complex into one molecule of hydrogen cyanide, one of benzaldehyde, and two molecules of sugar. They found the enzyme complex, with glucoside, in the bitter almond.

But the first documented specific use of a Laetrilelike substance in cancer is apparently that referred to in the *Gazette Medicale de Paris* (tome XIII) of September 13, 1845, by a Dr. T. Inosemtzeff, professor of the Imperial University of Moscow.[8] In this citation, the professor described two cases of dis-

7. Krebs Jr. discussed the vitamin B17 theory in "The Nitrilosides (Vitamin B17)—Their Nature, Occurrence and Metabolic Significance," *Journal of Applied Nutrition* 22, nos. 3, 4 (1970).

8. Cited by Wynn Westover, McNaughton Foundation, in *Summary of the McNaughton Foundation IND 6734 with Addenda, 1973* (P.O. Box 853, Sausalito, California).

seminated cancer apparently "controlled" successfully—one for over eleven years, the other for over three years—by the use of amygdalin. If the Paris medical journal account is indeed the first documented statement concerning cancer therapy with amygdalin, it would make 1834 the first year in which the Western world attempted to treat the crippling disease with a food factor.

But the rationale on which Ernst T. Krebs, Jr. rested a large part of his own background in the development of Laetrile or vitamin B_{17}, and on which a broad span of his own philosophy is based, is the relatively obscure work of a Scottish embryologist, Dr. John Beard (1858-1924), who had published his findings first in 1902 in the British journal *Lancet* and then in 1911 in the book *The Enzyme Treatment of Cancer and Its Scientific Basis*.[9] In his writings Beard elaborated a theory of the origin of cancer as novel and revolutionary (and actually simple) as any breakthrough in science, but it received little more than passing interest, and some hostile commentary. To this day, his basic theory of cancer is rarely taught, little understood, and accorded not much more than a footnote of passing interest.

Beard had found himself deeply involved with the study of a cell called the trophoblast. This mysterious cell, identified in 1857 and named in 1876, was known to play a specific role in pregnancy—eating out a niche in the uterine wall where the fertilized egg could gain nutrition from the mother's bloodstream. In orthodox embryology it is regarded as a layer of extraembryonic ectoderm and its name comes from the Greek words meaning "nourishment" and "tissue."

It was the activity of the trophoblast that puzzled Beard as it intrigued other scientists. An invading, autonomous, erosive cell that during pregnancy may be found in the blood and other organs outside the uterus, the trophoblast behaves in ways extremely similar to those of cancer. It was Beard who first asked himself the spine-tingling question: Is it possible the trophoblast—a natural part of the life cycle—and the cancer cell are the same thing? He decided to find out by tracing the histories of both kinds of cells.

He worked with elasmobranchs in order to be able to study the fertilized egg many times at all its various stages. He learned that the trophoblast arises, some way, from the primitive, undifferentiated germ cell. The trophoblast creates a protective covering for the embryo (the amnion) and the nutritive organ (the chorion) through which, by absorption, the embryo receives nourishment from the mother's blood in the first weeks of pregnancy.

Beard's studies were so carefully performed that (as later noted by Krebs Jr. and Sr. and Howard Beard—no relation to the Scottish embryologist) he was able to state that it is in the fifty-sixth day in the span of human gestation that the cellular trophoblast begins to undergo a dramatic deterioration—that is, with the development of the secreting function of the fetal pancreas. Something checked the further growth of the gestational trophoblast, Beard

9. London: Chatto & Windus, 1911.

believed, and the work of these invading, eroding cells began to diminish and stop—except in one instance.

That is when one of the most malignant forms of cancer known, chorionepithelioma (cancer of the chorion), develops. The disease can kill a mother and child in a matter of weeks. Doctors in Beard's day conceded that trophoblasts contributed somehow to the development of chorionepithelioma, but were not certain how. Beard concerned himself with determining what it is that in effect shuts down or fails to shut down the trophoblast, hence spelling the difference between whether the fetus will live or deadly chrion-epithelioma will develop.[10]

It was Beard who found the concomitance between the commencing function of the fetal pancreas and the beginning degeneration of the trophoblast. Broad comparative studies lent weight to his thesis that, in the span of normal gestation, the pancreatic enzymes are responsible for checking the growth of the gestational trophoblast, although it is not entirely destroyed. So trophoblast cells—characterized by their invasiveness, corrosiveness, erosiveness, and ability to metastasize (that is, spread)—are normal to the life cycle and are naturally inhibited within that cycle, Beard reasoned.

Beard turned his attention to another reality about the primitive germ cells that, undergoing differentiation, could ultimately be expressed as trophoblast. In the developing fetus, the majority of the primitive, undifferentiated germ cells cluster in the gonads, quite in accord with the demands of nature, since in the sex organs they mature into sperms or ova. But a minority of them (variously estimated at twenty to thirty percent) are dispersed, or "migrate," apparently at random, throughout the extragenital areas. Some of these dispersed germ cells come to rest in almost any part of the fetus and embryo. Under specific circumstances, they may attempt development into the life cycle, part of that development being the trophoblast. That is, the gross manifestation of this process outside the uterus might occur—at which time it is called cancer.

Moreover, Beard reasoned, if pancreatic enzymes are the inhibitors of the trophoblast in the span of gestation, then surely they should also be able to inhibit the trophoblast when it is extragenitally exhibited as cancer. If, for whatever reason, either the pancreas was not doing its job or the pancreatic enzymes were blocked in their action, then chorionepithelioma might develop—and surely, Beard reasoned, this meant that the same deficiency or deficiencies would also indicate that extrauterine trophoblast would also remain unchecked and would ultimately be manifested as cancer.

It has remained for researchers who took up the early work of John Beard to apply it with more data and research to the cancer riddle, to probe just *what* it is that stimulates the action whereby an undifferentiated germ cell may ultimately

10. Dr. Charles Gurchot, Ernst Krebs's former teacher and a Beardian himself, notes that "it is only fair to say that non-Beardians would claim that the degeneration of the trophoblast is brought about by the increasing pressure on it" by the rapid growth of the fetus.

develop into trophoblast (cancer). And it is here that the massive work and research by Krebs Jr. (though some of his conclusions are disputed by Gurchot, who also wrote on the subject) come into play.

Krebs indicates that the natural inhibition of trophoblast occurs as specific enzymes attack the "shield" of the trophoblast or neoplastic (cancer) cell, hence destroying the immunity of the trophoblast and allowing the lymphocytes to attack it. The malignant cell is also open to further digesting by the "deshielding" enzymes themselves, Krebs postulates.

In elaborating his thesis, Beard focused on the trypsins as the pancreatic enzymes that inhibit trophoblast (cancer), but emphasized that all the pancreatic enzymes were probably involved. Subsequent research has described chymotrypsin, particularly, and other enzymes as involved in the inhibitor effect.

For Beard, researching and writing seventy years ago, it all seemed to fall into place:

1. The trophoblast cell in pregnancy and the neoplastic or cancer cell are actually one and the same thing—two manifestations (one in gestation, one outside of gestation) of the same process.

2. The trophoblast has a specific role to play in pregnancy. Outside of pregnancy it is exhibited as cancer.

3. The trophoblast in pregnancy is inhibited by pancreatic enzymes; hence, the trophoblast outside of pregnancy, cancer, should be inhibited by them as well.

4. The treatment for cancer should be pancreatic enzymes.

Beard also believed the stereochemical structure of cancer proteins and cancer carbohydrates is opposite to the structure of the same things in normal tissue.

It was the research and study of Krebs Jr. that added more detail to the process, at least insofar as describing what might be taking place. Krebs Jr. and Sr. and Howard Beard, along with other researchers before them, postulate in their article on the matter[11] that it is the action of the female hormone estrogen, present in both sexes, that is the trigger of the change of the undifferentiated germ cells (which the Krebs work refers to as "diploid totipotent," meaning, in essence, able to reproduce a whole new entity) "with the consequent production of a gametogenous cell whose only alternative to death is division with the resulting production of trophoblast."

In this view, based on the work of Beard and brought to the modern era, it is incorrect to call cigarette smoking, specific viruses, various chemicals, poisons, radiation, and pollution *causes* of cancer. Their actions may very well elicit estrogen, and it is estrogen that, in the presence of undifferentiated cells which might be found anywhere in normal tissue, sets off the chain of events, of which cancer is the gross exhibition. That is, they may *organize* cancer, but not *cause* it. If Krebs et al. are correct, the only real cancer-causing agent (carcinogen) is estrogen, the innocent, natural stimulus to a chain reaction that

11. Ernst T. Krebs, Jr., Ernst T. Krebs, Sr., and Howard H. Beard, "The Unitarian or Trophoblastic Thesis of Cancer," *Medical Record* (July 1950).

will continue if the body's natural defenses against that reaction (pancreatic enzymes and the immunological system) are not functioning or their functions are somehow blocked.

It remained for Ernst T. Krebs, Jr. to define the pancreatic enzyme-immunological defense as the *intrinsic*, natural defense against cancer, whose deficiency would help bring cancer into being; and also to postulate that there is an *extrinsic*, natural factor in nutrition that constitutes the second line of defense against the disease.

For the researchers and scientists who argued among themselves as to details of Beard's work and theories which might flow from them, Beard had postulated the nature—the probably cause and control—of cancer. But his work was destined to go the way of that of many other scientists. Divergent from mainstream views, it was essentially rejected. Beard proved to be ahead of his time as far as the enzyme approach to cancer (and probably the nature of cancer itself) is concerned. It took years before his work, declining gradually into virtual obscurity, was rescued in California.

Ideas do not die. Nor did Beard's. The John Beard Memorial Foundation, established in San Francisco by the developers of what was to become Laetrile or vitamin B17—particularly the two Krebses and pharmacologist Dr. Charles Gurchot—was set up to perpetuate his work. It was the Beardian work on the enzymatic nature of cancer that underlies what the Krebses later called the *unitarian or trophoblastic thesis* of cancer. The Krebses, Dr. Gurchot, Dr. Howard Beard, and Dr. Frederick Shiveley have been the chief principals in continuing the original work of John Beard.

It should be pointed out here that by no means do all the researchers and supporters of Laetrile express complete concurrence with the John Beard thesis, or with its updating by Krebs Jr. (as the unitarian or trophoblastic thesis), or with both. Krebs Jr., who remains an outspoken champion of Beardianism, insists this less than complete concurrence is due to the failure of medical orthodoxy to train students in the unitarian thesis. Since they are not well grounded in embryology and a series of linking disciplines, Krebs charges, young medics are graduated who have no grasp of what he sees as the true nature of the second major killer disease in the U.S.A.

Too, such pre-Laetrile pioneers as Dr. Gurchot, the younger Krebs's former teacher, question both the validity of Beardianism to explain, across the board, the entire nature of cancer, and some elements of it defended by Ernst T. Krebs, Jr. Gurchot, who also wrote on Beardianism,[12] told me that, as far as he is concerned, "the Beard theory is not completely correct. You can say Beard is *essentially* right, that he is *probably* right, but this is not so in all details."

Also, Dr. Gurchot dissents from Krebs's interpretation of the rise of the trophoblast: "The onset of cancer should be modified to say that trophoblast will result from the development of a germ cell through gametogenesis—with

12. Charles Gurchot, *Biology—The Key to the Riddle of Cancer* (New York: Moore Publishers, 1949).

or without meiosis," he said as the result of correspondence with another scientist, J. B. S. Haldane.

Dr. Gurchot speaks of totipotent (not specifically diploid totipotent) cells as dispersed through the soma or natural tissue, and believes that while estrogen indubitably plays a role, it may not be estrogen exclusively that excites the chain of events whose ultimate expression may be trophoblast (cancer). "All cancer-producing substances do have estrogenic properties," Gurchot told me. "It certainly appears that estrogen may have a good deal to do with cancer development."

As early as 1944 and the "modern era" of cancer research, at least one more voice was added to the idea cancer might, conceivably, be a very natural part of the scheme of things—a feeling to be updated later by Ernst T. Krebs, Jr., when he stated his belief that there is nothing naturally malignant in the universe, or that does not at least have its controls within the universe.

Charles Oberling observed, in 1944: "Some day, perhaps, it will turn out to be one of the ironies of nature that cancer, responsible for so many deaths, still is so indissolubly connected with life."[13]

It should be stressed here that while there is at least philosophical intimacy between the evolution of Laetrile and its presumptive chemistry and Beardianism itself, not all defenders of Laetrile by any means agree that the universal answer to the question of the cause of cancer has been found within the unitarian or trophoblastic thesis. They are able to make this statement while nonetheless believing in Laetrile as the best extant weapon against cancer.

For orthodoxy and officialdom, the theory might be said to explain the development of some specific forms of cancer, but they reject out of hand—and with painfully little enthusiasm for looking into the matter—Beardian pronouncements suggesting that the trophoblast approach explains all, or most, cancers. This, of course, springs from the conventional wisdom, still held in the 1970s, that cancer is a widely varied series of diseases, whose total causes and controls are not yet known. The epidemic incidence of cancer is the best indicator that orthodoxy and officialdom are far from the mark.

13. Charles Oberling, *The Riddle of Cancer*, trans. Woglon (New Haven: Yale University Press, 1944).

4

"My God, It Works!"

How Laetrile—vitamin B_{17}—came to be developed is, as are so many things in science, a story of coincidences, lucky breaks, and a considerable dash of hardheaded individualism.

The coincidences abound—not the least of them being that the family name of the father-son team who devoted so much of their lives to the cancer riddle, Krebs, means "cancer" in German; and that Ernst T. Krebs, Jr.'s processed vitamin B_{17} was given a brand name highly reminiscent of, but utterly without any connection to, the patent medicine from the early nineteenth century mentioned earlier. That another Beard helped update the original theory of John Beard (no relation), and that the eventual use of apricot pits as the source of Laetrile was based on a botanical classification error by the elder Krebs are other tantalizing elements.

I did not know Krebs Sr. personally because he had died months before I became interested in the vitamin B_{17} story. But I met several people who knew him, including his patients, and they uniformly recalled his loving, kindly character. His early work at efforts to unlock the cancer riddle is the second major strand of that story, the pioneering enzyme theory of John Beard being the first.

For what eventually grew out of Ernst Krebs, Sr.'s virtual obsession with bulldogging the cause and cure of cancer was what his son and other laetrilists would ultimately call the *extrinsic* control of cancer: the use of an accessory food factor as a vital weapon against clinical cancer and, even more exciting, its probable use as the cancer preventative par excellence.

Born in 1877 in San Luis Obispo, California, Ernst Krebs, Sr. earned his medical degree from the College of Physicians and Surgeons, San Francisco, and then moved around the Western United States for the better part of two decades. Ernst Krebs, Jr., the first of his four children, was born in 1912 in Carson City, Nevada, where his father, a classical country doctor setting forth on his

rounds on horseback or in a carriage, also worked as a physician among the Washoe Indians, one of whom, an orphan girl, was adopted into the Krebs family.

Some of the early remembrances of Krebs Sr. come from Dr. Charles Gurchot, a pharmacologist who worked with him for years in pursuit of the enzymatic control of cancer and who, with Dr. Leon Lewis, was a stimulus for the elder Krebs to persevere in the development of his special compound. It is Dr. Gurchot who told me of the strange and at times amusing events that led Krebs Sr. into the cancer problem, and his son into developing what came to be Laetrile.

Krebs Sr., though a physician, had also studied pharmacy. He had a marked flair for investigation, research, and new ideas: traits all apparent, later, in his son. He set up his own laboratory in San Francisco's Mission District and maintained his office above a pharmacy across the street. The Krebs family settled into a Queen Anne mansion on South Van Ness Avenue. In this stately edifice both Krebses lived, studied, and worked. Krebs Sr., still active in his nineties, was a fixture at the home until his last day. Krebs Jr. maintains his office there.

The elder Krebs turned his attention, in part, to the development of new ideas in medicine and thereby incurred his first negative brushes with medical orthodoxy—particularly when he produced an antibiotic called Balsamea to aid in the treatment of respiratory ailments. Though this occurred ten years before Sir Alexander Fleming discovered penicillin in 1928, all Krebs Sr. received was criticism. Told by the American Medical Association that Balsamea was worthless, he withdrew from the medical association and never returned.

More than Balsamea came out of Krebs's Balsamea Laboratory, though, and he became known as an innovative, experimenting physician. How these innovations and experiments ultimately turned to the apricot has been recalled in detail by Dr. Gurchot, who was told the whole story by Krebs Sr. himself.

"During Prohibition, whiskey was smuggled into San Francisco from boats," Gurchot remembered. "The smuggled stuff sometimes had wood alcohol in it, so the smugglers had their stuff analyzed for wood alcohol before anyone bought it. To do this, they had to give it to a lab. So it wasn't strange that he [Krebs] got a great many calls from bootleggers to see if he could analyze their alcohol.

"At first, he said he was not equipped to do this, but he got so many calls he figured it would be lucrative to get into the alcohol analysis business. So he finally accepted, and started analyzing specimens. He said most of the stuff was awful and tasted terrible, and he wondered why couldn't somebody make a synthetic bourbon flavor and add alcohol to it. So he set himself to this problem and got a dentist to work with him."

Gurchot remembers that Krebs Sr. told him he was particularly interested in determining what role the aging process played in changing the taste of the whiskey and also how the various impure ingredients causing people to become ill could be cleansed from the product. His attention became focused on the staves of the oak barrels containing the smuggled whiskey, particularly

to that point where the alcohol content was sufficiently low and the water content sufficiently high to allow the growth of a kind of mold, which Krebs called "cryptogams" (after the old name for plants not having true flowers and seeds).

The probing medic determined that the mold produced enzymes, which were released into the alcohol and worked on the raw whiskey. But only a very small amount of the mold was available, producing a very small amount of enzyme, and this caused the aging process to be faithful to its name and take a long time.

His curiosity piqued as to what kind of enzymes were present in the barrel staves, Dr. Krebs next made shavings from the oak staves, Dr. Gurchot recalled, and moistened them with nutrients that they might derive from the whiskey. He added vitamins and flour made from acorns, "which he decided was a very good nutrient." The shavings were toasted to a golden brown, moistened with water containing vitamin B_1 and acorn flour, and this mixture ground up in water. He let the preparation stand in a glass-covered jar for a few days. At the end of this time, Krebs discovered the concoction to be covered by a hairlike growth of mold.

He next poured the raw whiskey upon the mold preparation occurring on the oak wood and allowed it to remain for several days. He then poured off the raw whiskey, filtered it, and boiled the resulting product. After thirty days the process had "remarkably" changed the taste of the whiskey. Still determined to find out what enzymes were involved, he determined that proteolytic (that is, protein-digesting) enzymes played a role when he put up a liquid extract of the mixture with the white of an egg and left it overnight. The substance ate the egg white. "This was the cataclysmic event," Dr. Gurchot recalled. "Dr. Krebs told me, 'When I saw that enzyme doing all that digesting, it occurred to me it could be useful in cancer. Maybe you think I'm crazy, but that's what I thought. The idea haunted me, so I decided to try and find out if it could do anything good in cancer.' "

It did indeed become an obsession. Plunging right into the work that had originally been stimulated by the hunt to determine how smuggled whiskey could be made to taste better, Krebs set about trapping rats in the basement of his home, hoping to catch one with a tumor so he could see if his oak mold extract might have a similar effect—that is, "digest" the tumor. This series of events all occurred in the early 1920s—just when is not known. Finally, the senior Krebs did find rats having tumors. He thought they were cancerous but did not conduct laboratory tests. He started a series of injections and these early tests did in fact indicate some ability in regressing tumors. The fact that some treated rats remained frisky and ran away indicated to him that the injected substance was essentially nontoxic; but at least one rat died. The results, then, were scattered and the conditions were hardly scientific ones. But Krebs felt he was definitely on to something.

We do not know exactly how many animal experiments the elder Krebs conducted or how long they went on. We do know he was motivated to continue his work, a deeply searching investigation that continued alongside his

own lively medical practice. Gurchot remembers Krebs's telling him that at one point he succeeded in getting the University of California Medical School to try out the extract on rats there, but the tests failed to disclose any effect.

At some point during the experiments his initial batch of material ran out, and when he prepared a second supply of it he found it was not effective. He made a third supply of extract with the same lack of results and even ordered "bourbon oak" from Kentucky. There was no success here, either. What to do? Anyone else would have given up, but not Dr. Krebs. His thinking, recalled Gurchot, was that "perhaps if I use some other plant that is related I can get an extract that is not capricious." Gurchot recalled: "He said to me, 'the oak belongs to the rose family—therefore, if I could use the extract of a plant from the rose family maybe it could be active.' " The error, noted Gurchot, is that the oak does *not* belong to the rose family. But no matter, he kept a lookout for plants he presumed to be from that family.

It is here that a family interest played a key role. The Washoe Indian girl invited into the family earlier had grown up, fallen in love with a young Hawaiian and had married him. Gurchot said he recalled that the young man was related to the last queen of the Hawaiian Islands, Liliuokalani (1838-1917), who may or may not have left cash bequests to her family. Be that as it may (and we add the doubt since the Hawaii State Historical Society had no such precise record), the Washoe-Hawaiian couple received a $50,000 inheritance. With it, they moved to Oakland, California, and bought a ranch of apricot trees.

"They kept relations with the Krebs family," Gurchot said. "Apricots belong to the rose family, so Krebs thought he would have a ready supply, figuring the extracts could be obtained from the seeds and kernels. So he made an extract and, lo and behild, it *was* effective." The process, continued Gurchot, consisted of removing the oil from the kernels (or pits), grinding them up in water, filtering the soup, precipitating the filtrate with alcohol, drying the precipitate, redissolving it, then injecting it. There is at this point some confusion as to exactly how much animal experimentation went on, and exactly when the extract was experimentally used on humans.

Wynn Westover, a staff consultant to the McNaughton Foundation, has done much of the research on the early Krebs papers referring to the development and use of this early extract, and he has noted that the physician believed he was extracting enzyme substances from the apricot pit. "Among the substances he tentatively identified were 'emulsin, amygdalase, prunase, pectinase' and others," Westover wrote.[1]

Glenn Kittler records that some of Krebs's tests involved work with mice especially bred to respond readily to the various carcinogens known to elicit cancer.[2] Some such animals could even be purchased with cancers growing in

1. Wynn Westover, "Listing of Documents Relative to the Krebs Enzyme Extracts Later Known as Laetrile," in *Summary of the McNaughton Foundation IND 6734 (April 6, 1970-February 1971) with Addenda,* McNaughton Foundation, P.O. Box 853, Sausalito, Calif., 1973.

2. Glenn Kittler, *Laetrile—Control for Cancer* (New York: Paperback Library, 1963).

them in specified areas. These tests, again, showed mixed results: reductions in some tumors, but the sudden deaths of some mice as well. That there was some effect to the extract seemed obvious, but that it had some toxicity also seemed obvious. Gurchot said he did not recall Krebs ever mentioning the precise events as mentioned by Kittler, adding that the physician found the extract mostly nontoxic.

The pharmacologist remembered that when Krebs finally turned to the use of his presumably harmless extract on humans, he found a relatively consistent pattern of pain reduction and other mixed, but generally optimistic, results. There are divergent accounts of just how and when he turned to work on humans. But eventually he did, and he continued to work on trying to purify and improve the extract thereafter. The investigative medic pursuing the elusive answer to cancer did not charge his cancer patients, and his research with them eventually cut into his regular medical practice, but by then the cancer battle had become his primary preoccupation.

Gurchot recollected that of about twenty-five of the early cases he had discussed with Krebs there were no toxic effects *per se*, even though cancer-stricken patients reported some side effects, usually chills and illusions like "crawling of ants" in the tumor area. But across the board cancer patients reported the reduction of, or complete disappearance of, pain—a dramatic analgesic effect.

About the year 1928 or 1929 the first patients were injected with the new extract which Dr. Krebs had previously tested on animals, Westover has determined. It was a little later than this that Gurchot met Dr. Krebs. This was because both he and the medical doctor Leon Lewis were working at Sonoma State Home, a California state hospital, and were involved in research on enzymes and cancer. When they learned that a San Francisco Mission District doctor was also experimenting with enzyme chemistry and cancer, they became extremely interested and got together with him, thus touching off a collaboration that was to last for many years.

By this time, Gurchot remembered, the senior Krebs, who had become intensely interested in enzymes and was reading all he could about them, had elaborated a theory of the beta-glucosidic structure of cancer protein "because cancer was apparently successfully treated by a beta-glucosidic enzyme, emulsin." This was basically the theory Krebs was working on at the outset of the investigative collaboration, beginning in 1932, with Doctors Gurchot (a pharmacologist and biochemist) and Lewis (an M.D.). The collaboration, Gurchot insists, served to revitalize the senior Krebs's interest because the San Francisco physician had become "disgusted" with the derisive attention his enzyme approach had received.

Krebs made available to them several ampuls of his extract and Lewis tried it on a cancer patient. The result of the first use by Lewis, Gurchot recalled, caused the physician to exclaim, "My God, it works!" Under appropriate conditions, it was determined that the patient was showing several changes, particularly reduction in pain. The single case revealed an enormous potential for further research.

Since Krebs Sr. believed emulsin was the essential cancer-combating ingredient in the extract, Gurchot prepared a batch of extract with the enzymes killed. "I didn't tell him [Krebs]," he said. "Then a few weeks later I asked him to see how active the material was. He reported he had treated people successfully. I told him it didn't have any emulsin in it and at first he didn't believe me." The three scientists continued trying to find what the active ingredient was. Gurchot recalled that the mystery of the active ingredient remained well into the 1940s. But for the time being, he knew that something about the extract was having a definite positive effect on cancer patients.

As a result of correspondence with Krebs, the International Cancer Research Foundation in Philadelphia invited Gurchot and Lewis (in 1933) to the Eastern city for a year, with full cooperation promised for clinical (human) studies of the Krebs extract. The clinical studies were conducted in three large hospitals, and research on the presumed enzymes was carried out at Cornell University, Ithaca, New York, with Gurchot in charge. Lewis and Gurchot were told that they would be given only very advanced cases because "all we want to do is see if there is any change taking place at all." At the end of a year, the results were to be assessed to see what the next course of action should be.

Gurchot remembered that for a year the "moribund" human cancer cases were treated by injection. Effects were noted strongly indicative of positive palliation—even tumor size reduction, though the patients ultimately died. Gurchot recalled with amazement that "during all this time nobody (from the medical staffs) even came to observe—but nobody." So when the year was up and all the Californians had to show for their efforts was a series of deceased cancer patients, they learned the project was at an end. And the man who was to become Ernst T. Krebs, Jr.'s mentor returned to California to teach at the University of California Medical School's Department of Pharmacology; he continued his interest in the cancer problem, never shaking his belief that the Krebs extract had an obvious key role to play in that problem.

In the meantime, the Krebs extract had received attention elsewhere. Wynn Westover of the McNaughton Foundation, rummaging around in the Krebs attic, found and collated many of the documents and correspondence relating to the use by other scientists, in the 1930s, of that extract. Among them are references to a Tokyo physician named Hatta using enzyme cancer treatments, one of which involved saving "an inoperable breast and gland involvement case in the royal family." Another, from patent attorney T. Akiyama, suggests that the seed of *Prunus armeniaca* (apricot) was "known to the public from old times ... internally or externally applied as a medicine for tumors." Notations and correspondence from China, Czechoslovakia, Canada, and Austria indicate treatments with or clinical trials of enzyme extracts, aside from the cases being studied in the United States.

In 1934 and 1935 Dr. Krebs also collaborated with Dr. Arthur Stoll of Basel, Switzerland; each sent the other ampuls of extract prepared according to the Krebs formula and each continued clinically testing the products of the

other. About the same results were obtained: regression of tumors and relief of pain. From then through 1938, several physicians around the world were experimenting with the Krebs extract, including New York City's Dr. James Ewing, who became a steadfast supporter of the formula and its need for much wider testing in human cancer cases.

This was the atmosphere in which Ernst Krebs, Jr. grew up—cleaning up after laboratory animals, taking care of supplies, and acquiring the patience for detail necessary to the empirical method and to the hours of experiments and testing he would later carry out. The intellectual atmosphere was also stimulating, for science, religion, philosophy, and art were regular concerns at the Krebs mansion. Krebs Jr. became a philosopher of sorts, and the development of a mind reaching out to explain the mechanics of health and disease in an orderly universe started early. It involved interest in Illinois lawyer and skeptic Robert G. Ingersoll of the nineteenth century, and Krebs's quoting of Ingersoll from memory while debating during religion classes at nearby St. John's Lutheran School served him well.

The junior Krebs, reportedly a brilliant student in school, decided to follow in his father's footsteps and entered Hahnemann Medical College in Philadelphia. Eventually he was to go to the University of Illinois for a bachelor's degree in bacteriology and then to transfer to the University of California for matriculation in pharmacology and, later, in anatomy. It was during the summer of 1938 that the young medical student went to work for Dr. Gurchot in the latter's pharmacological laboratory at the University of California.

At this time, Gurchot was trying to find any and all explanations for the origin and treatment of cancer, a pursuit which paralleled the younger Krebs's growing interest in the enzyme approach his father and Gurchot were continuing to work on. During the younger Krebs's visits to the Gurchot laboratory during vacation periods and other times, he expressed an interest in becoming a graduate student in pharmacology to work on the problem. He did indeed matriculate as a pharmacology student under Gurchot and thus began the second collaboration, sometimes stormy, which would finally lead to Laetrile.

At this point, none of the principals knew about the John Beard theory; they were simply pursuing the enzyme approach to cancer treatment. Gurchot and Krebs Jr. and other students talked about "curious methods of treating cancer that had been used," said Gurchot. "So one day in 1938 Krebs burst in carrying a book, slapped it down and said, 'Here's one for your collection.' " Young Krebs, an avid reader, had become attracted to the old tome because of the word "enzyme" in its title. It was, in fact, John Beard's 1911 book, *The Enzyme Treatment of Cancer.*

Gurchot recalls that he simply placed it on his microscope table and didn't begin to peruse it until a couple of weeks later. "The more I read it, the more amazed I became," he said. His own wide background in various linking disciplines convinced him of Beard's "remarkable biology." After immersing himself in Beard's work (first published in 1902), "I realized the guy really had worked out the cause, the biology of cancer," Gurchot

recalled. "I gave a seminar on it. Everybody was fascinated. I gave three lectures on it at the UC Medical School. After it was all over, the doctors thought it was the greatest thing ever—or the greatest hoax. So I read more about Beard."

When Krebs Jr. returned from a vacation, the two men, mentor and student, discussed the work. There are diverging accounts of what happened next, but the result is that young Krebs, the voracious reader, decided to check out the Beard theory every way he knew how—through intensive reading and research. The spark was ignited in what was to become Krebs Jr.'s own obsession, which would lead not only to Laetrile but to the entire vitamin B_{17} concept of cancer prevention as well. The challenge of Beard caused Krebs Jr. to make a key decision: to switch from medicine to biochemistry to devote full time to the cancer riddle. The young Krebs pointed to a total of nine years of university studies (including bacteriology, physiology, anatomy, pharmacology, and medicine). He said he taught himself to read French, German, Spanish, and Italian in order to peruse 17,000 scientific papers, books, and research documents over the course of years of research.

The Krebs Sr.-Krebs Jr.-Gurchot collaboration focused on chymotrypsin, one of the pancreatic enzymes that (based on the Beard theory) manifests antithesis to the trophoblast cell—which is cancer. Krebs Jr. told me it was in 1943 that they developed the first crystalline chymotrypsin commercially available in the country and then the world. "It was made to be used clinically for its possibly palliative effect in human cancer," he said, noting that "the seed preparation—the apricot extract preparation—had been set aside because of its overt toxicity."

The work with chymotrypsin, proceeding on different fronts (Gurchot, from Chicago, noted fifty to sixty cases of chymotrypsin use on cancer, only one of which resulted in complete recovery), was only part of Ernst T. Krebs, Jr.'s full-time involvement. He set out to update the Beardian theory, to demonstrate that it alone was the appropriate explanation for the myriad manifestations of cancer, and that treatment based on its premises held out the only real hope to solve the cancer problem, which increasingly was becoming a runaway health crisis.

After years of research, study, duplications of experiments, and applications of the Euclidean principle that two things equal to the same thing are equal to each other, he was ready, by 1947, to announce to the scientific world the results of his studies, including a compilation of thirty characteristics shared by the trophoblast cell and the cancer cell, and noting the specific antithesis of chymotrypsin to cancer cells. What little attention was directed to this compilation was mostly good.

It was not until 1950 that the two Krebses, with Texas biochemist Howard Beard, published "The Unitarian or Trophoblastic Thesis of Cancer" in the *Medical Record*, which, in a sense, constitutes (with John Beard's writings a half century earlier) the bible of the vitamin B_{17} scientific religion. In it forty-two shared trophoblast (cancer) traits are noted. The medical world, strongly influenced by the viral theory of cancer—an approach dominating

cancer research into the seventies—paid little attention to the paper, but the Krebses plunged on anyway, with Krebs Jr. continuing extract experiments.

The younger Krebs had earlier found that chymotrypsin experiments were more discouraging than encouraging. Working apart, Gurchot (who had left the University of California in 1945 and had also ended his close collaboration with the Krebses, although the scientists remained in touch ever after) found that the sequence of events in chymotrypsin therapy seemed to be this: an immediate improvement in cancer patients followed by a return of their symptoms. Gurchot nonetheless maintained interest in Beard and authored *Biology—The Key to the Riddle of Cancer* in 1949.

Krebs consistently noted that chymotrypsin lacked the force to do the specific job that Beard had attributed to it in his theory. Whether other enzymes were involved or some other, missing ingredient played a role, the junior Krebs did not know. He turned to his father's earlier extract, use of which had been complicated by the continuing presence of an unknown factor causing reactions suggesting toxicity. Two key elements were still big puzzles about the extract: (1) Exactly *what* did the demonstrated job of causing tumor reduction and analgesic effects? (2) Exactly *what* caused the toxic symptoms? He set out to improve the apricot-pit preparation.

Both Gurchot and Krebs agreed that the clue to the toxicity factor was provided by former UCLA pathologist Dr. Clifford Bartlett, who demonstrated that the various reactions reported by some patients injected with the extract were the typical reactions of cyanide. The bells were now ringing. Ernst T. Krebs recalled that the old extract did indeed have cyanide, from the compound amygdalin (a beta-cyanogenetic glucoside that Krebs would later call vitamin B_{17}). The extract had a whole host of other elements and enzymes, including emulsin. Krebs toyed with the fresh and tantalizing reality that cyanide might very well be the blessing and the curse of the old extract—that selective release of cyanide at a tumor site was actually the weapon that inhibited tumors, but that premature release of the poison (for example, by the enzyme action of emulsin during the processing of the extract) would produce some toxic effects.

The theory on which the biochemist ultimately worked, and which has been a source of some controversy among the laetrilists, is this: that the enzymes called beta-glycosidases, able to break down the old extract and release its cyanide, are massively present in cancerous areas. Yet, he puzzled, since it is true that people normally consume small amounts of cyanide daily in certain fruits and vegetables and wondering why cyanide did not destroy normal cells, he researched the subject of yet another enzyme: rhodanese. Discovered in 1933, the substance had been shown to be equipped to detoxify cyanide-bearing substances. And, most important, according to Krebs Jr.'s research, it was known that cancer cells are deficient in rhodanese. If rhodanese was a natural defense of normal tissue against cyanide, if cancer cells were deficient in rhodanese, and if beta-glycosidase released cyanide, then clearly cancer was defenseless against cyanide.

Krebs set himself the challenge of altering his father's extract so that the

cyanide would remain safely bound in its compound until reaching the hydrolyzing (breaking-up) enzymes at cancer growth sites—that is, he had to devise a chemical pistol that would fire its fatal bullet only at the enemy. The research on amygdalin convinced him that the key lay in further refining the extract until what it amounted to was purified amygdalin. The process is not mysterious, he pointed out as late as 1974 when he addressed the San Francisco Vegetarian Society for Health and Humanity:

> The first step in the present production, which is from natural materials, is to grind the apricot seed or kernel; then it is defatted with a cold solvent, such as ether, hexachlorine, or other such substance, and then the solvent is driven from the remaining ground pulp and a completely fat free powder which is partially soluble in water is left. The Laetrile (amygdalin) in this powder as well as the sugars are also soluble in alcohol and Laetrile (amygdalin) happens to be selectively soluble in boiling alcohol about 40 times greater than in cold alcohol. The fat free powder is then added to boiling alcohol where Laetrile (amygdalin) is extracted from the powder and then the materials are filtered. The filtrate that remains is put in a freezing cabinet or refrigerator and cold room where the temperature is brought down to about 10 degrees Centigrade. The crystals of Laetrile precipitate or fall to the bottom of the flask because in cold alcohol the material is insoluble. Now these crystals are recovered and the process of recrystallization is repeated a number of times depending upon whether the material is to be used for oral purposes or for injection. When the chemicals are dried the first time, they have a chemical purity of about 99.7 or 99.8 percent pure. For oral purposes, it is repeated twice.[3]

Krebs Jr. projected the possible development of synthetic forms of the extract, and his description of the chemistry in such a development excited controversy almost immediately. He derived the name "Laetrile" from a compound which he described as a *laevo* (left-moving)-mandelon*itrile*-beta-glucuronoside. In earlier papers, Krebs discussed the projected or assumed actions of both the natural and the synthetic "laetriles," the key point being his assertion that specific enzymes break down specific versions of the compound.

The name "Laetrile," so close to the sound produced by "Leotrill," the patent medicine, is only one symbol of a process having come full circle. Through trial and error, hit and miss, the Krebses and their collaborators had actually *returned* to the ancient use of amygdalin in natural foods. But equipped with modern processing techniques, they were now able to process, purify, crystallize, and freeze-dry the amygdalin alone for medical use. An intriguing chain of events had occurred:

- John Beard had postulated that the trophoblast in pregnancy and cancer are actually one and the same thing, that a pancreatic enzyme inhibits both.
- "Non-Beardian" cancer researchers had become interested in enzymes as they might relate to cancer.
- An innovative, investigative M.D. with pharmaceutical training had become interested in enzymes in order to measure the effects of the aging

3. San Francisco Vegetarian Society for Health and Humanity newsletter, January 1974.

process on bootleg whiskey, discovered that enzymes in a whiskey-testing concoction he had made digested the white of an egg, and then wondered if this could not somehow relate to cancer.

- By misclassifying the trees from which the whiskey barrel wood came and through a familial relationship that resulted in handy access to a supply of apricots, the same doctor was provided with the supply of a substance from which to make an extract for investigation.
- His son, piqued by curiosity, came across John Beard's book and through him it came into the hands of an enzyme researcher uniquely qualified to understand it fully and explain Beard's biology.
- The coordinated effort to substantiate John Beard's ideas through use of chymotrypsin was only partially successful, so the son went back to an investigation of his father's earlier extract process.
- The result was Laetrile.

It was not until 1949 that Ernst T. Krebs, Jr. was ready to inject himself with the first human shot of the purified substance. While some have attempted to enshrine that moment as an instant of great danger since, theoretically, cyanide was present (though tightly located in the amygdalin compound of two molecules of a sugar, one molecule of benzaldehyde and one molecule of hydrogen cyanide) though the bodily defense against cyanide by rhodanese was known, Krebs shrugs the moment off: "Hell, no, I wasn't scared. The odds were overwhelmingly with me. I was dealing with the known."

At any rate, he survived the first injection and took it to mean that his long years of study and work were correct, and in every aspect: the material was safe for human use. Had he had cancer, enzymes would trigger the lethal release of cyanide at the site of the tumor, while his natural noncancerous tissue was protected by rhodanese. If he had no cancer, the body's natural processes would slough off the Laetrile naturally.

It is essential to point out here that there is not a unanimity of opinion as to the precise action of Laetrile—or vitamin B_{17}, as it was later called. To this day, Dr. Charles Gurchot questions the exact series of events in the Laetrile reaction as described by Krebs and states that the cyanide action is "not proven." He told me: "It is reasonable to suppose that the action of Laetrile on cancer cells is that it releases cyanide, but this is still not conclusively proven." And Dr. Dean Burk, Laetrile's chief defender within the otherwise hostile National Cancer Institute, told me: "Both Dr. [Hans] Nieper and I have conceived of several mechanisms of action of amygdalin which have nothing to do with any action of cyanide."[4]

Part of officialdom's critique against Laetrile (amygdalin, vitamin B_{17}) was based on the alleged failure of tests to duplicate the precise action

4. Dr. Burk has also demonstrated a synergistic increase in antitumoral activity between the released hydrogen cyanide and benzaldehyde. The National Cancer Institute's cytochemistry division chief is nonetheless extremely careful about making conclusive statements as to the theoretical action of Laetrile, aside from its demonstrated chemical action. "Everybody usually appreciates it when I point out that old Charlie Chan statement: 'Charlie Chan say beware of theory—dew on eyeglasses can obscure fact,'" said Burk, doubtlessly taking some liberties with the inscrutable Oriental detective.

described by Krebs.[5] These realities, however, fade alongside the greater one: that Laetrile works—if, by "works" we describe reactions varying from relief of pain (the overwhelmingly common reaction) to outright regression of tumors. If ultimately it is determined that another action or actions are somehow involved it will constitute another example, as occurs so often in history, that Laetrile "is right for the wrong reason."

In the meantime, vitamin B17 researchers have continued the hunt for uses of other beta-cyanogenetic glucosides, and it has been Ernst T. Krebs, Jr. (see chapter seven) who has propounded the theory that the full range of these substances, lumped together as vitamin B17, constitutes the natural, extrinsic prevention of cancer when the natural, intrinsic mechanism (pancreatic enzymes and the immunological system) is malfunctioning.

For the San Francisco biochemist, an important piece of evidence in his own philosophy is being demonstrated in the cancer battle: there is nothing naturally malignant in the universe. Cancer is not formed by an alien, outside force but through natural processes that run wild when man's tampering with nature has removed or diminished the natural restraints on those natural processes. In the case of cancer, the cancer cells (as trophoblast) have a specific job to do, are a natural part of the life cycle. When they remain unchecked because the metabolism is out of balance, the result is demonstrated as cancer. Correct the metabolism, and the cancer will be inhibited in the first place—this is the chief argument of the vitamin B17 proponents.

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5. Part of the problem stems from the fact that not enough is known about the interaction of some specific enzymes. In his paper entitled "The Nitrilosides in Plants and Animals" (in *The Laetriles—Nitrilosides—in the Prevention and Control of Cancer*, a compilation by the McNaughton Foundation of vitamin B17 papers on the vitamin's therapeutic implications), Dr. Krebs makes some educated suppositions about the action of Laetrile and suggests what might be the case with a synthetic Laetrile. His studies had already indicated the heavy (and indisputed) concentrations of the enzyme beta-glucuronidase, which is produced by the contiguous somatic cells in response to the presence of estrogen (estrogen being, again, the presumptive single stimulator for the division of a totipotent cell into a gametogenous cell with the consequential division into trophoblast). He states: "When the nitriloside . . . is parenterally (that is, outside the digestive system) administered as such it enters the bloodstream as an intact molecule. Malignant lesions are focally characterized by an especially high and selective concentration of beta-glucosidase and beta-glucuronidase. An extensive literature describes the high focal concentration of beta-glucuronidase that characterizes most malignant lesions. This concentration is often in excess of 300 times that of the contiguous somatic tissues. There is also a substantial literature describing the deficiency of the definitively malignant cell in rhodanese. The occurrence of beta-glucuronidase appears to be paralleled by an equal concentration of beta-glucosidase. Both enzymes are described generically as *beta-glycosidases*. Synthetic glucuronosidic nitrilosides (Laetrile) have been synthesized to exploit the beta-glucuronidase system in the same manner in which the natural nitrilosides are used against the beta-glucosidase system at the malignant lesion. In comparative studies it has been found that both the natural and synthetic nitrilosides are active against their respective enzyme systems." In a memorandum of March 18, 1972, to a Massachusetts Institute of Technology researcher, Krebs pointed out: "As you know, the natural nitriloside or Vitamin B17 is a beta-glucosidase. This is in itself not a target for beta-glucuronidase. We strongly suspect, however, that a beta-glucosidase system with an optimum pH (i.e., hydrogen ion concentration) below 6.0 is operative in neoplastic cells or tissues. Whether the same enzyme is also present but inactive at the lower hydrogen ion concentrations of the corresponding normal or somatic tissues—or whether the enzyme is unique to the neoplastic tissue—we do not know. I strongly favor the former hypothesis at this time."

Krebs experimented with several forms of the new, purified extract. As late as 1965, a study conducted for the California State Department of Public Health on the composition and chemical behavior of two kinds of Laetrile from the United States and Canada found the products minimally differing from each other. One product tested contained sucrose and di-isopropyl ammonium iodide and was described as an "amorphous solid." Another, called a "colorless solution," had a trace of phenol but neither of the two other elements. In both cases, the primary ingredient was identified as amygdalin.

In its rulings against Laetrile, to come later as officialdom responded with venom to the simple new approach to cancer, the state of California referred specifically to the beta-cyanogenetic glucosides (or "laetriles," the quotation marks added by the statutes) as the substances held to be illegal in cancer use, and specifically ruled against the two beta-cyanogenetic glucosides amygdalin (with or without di-isopropyl ammonium iodide) and prunasin, "commonly known as 'laetriles.'" In later U.S. federal tests, Laetrile was referred to as "amygdalin-MF" (McNaughton Foundation). Hence the confusion between the various descriptions—those occurring in science as amygdalin, beta-cyanogenetic glucosides, cyanophoric glucosides (and glycosides); and the Krebs-compounded words "Laetrile," "nitriloside," and "vitamin B_{17}"—all essentially the same thing.

Back in 1950, proof that a cyanide-bearing compound was safe for use on humans did not mean that it was of any use in conquering cancer, so the Krebses, father and son, embarked on careful research and experimentation to build a case for the credibility of Laetrile therapy. The first Laetrile treatment of human cancers, given intramuscularly and involving only ten milligrams,[6] almost fractional compared with the dosages given today, was provided for the elder Dr. Krebs's terminal patients. The small dose was used under the theory that at this level it could be controlled, since the amount of cyanide rhodanese could tolerate in humans was not known. Decrease in pain was the common denominator of these early tests on patients. Weight gain and appetite were noted too, but death was still inevitable. In several cases, death was prolonged far beyond the original estimated times, a point which gave the Krebses great hope.

From the beginning, father and son ran into considerable disbelief and unwillingness to experiment with amygdalin on the part of other men in the medical profession, even when they were able to demonstrate reduction of pain and an increase in the feeling of well-being among their patients.

An early pioneer in the field was Los Angeles physician Arthur T. Harris, a South African who had been in the United States since 1928 and who was preparing to return to his homeland when he heard about the Krebses' compounds. Herewith another coincidence in the vitamin B_{17} story: Dr. Harris had studied embryology under John Beard at the University of Edinburgh, Scotland, and was fully acquainted with the long set-aside trophoblastic theory of his former mentor.

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6. Kittler, *op. cit.*—the source of the early (1950-53) descriptions of Laetrile therapy.

Believing that the Krebs cases and Laetrile provided the proof in the Beard theory pudding, Dr. Harris reversed his decision to return to South Africa, opened an office, and, in 1951, began treating patients with the compound. He began with a thirty-six-year-old divorcée with cancer of the cervix who had refused treatment by surgery or radiation. The spectacular turnaround in her case—Dr. Harris reported her alive and free of cancer symptoms ten years later—spurred him to further treatments.

In a sixteen-month period, he treated eighty-two patients, reporting three of them clinically free of cancer, twenty-four still alive and comfortable, and fifty-five with only temporary help from Laetrile. The results were plainly encouraging.

In the meantime, several other Los Angeles doctors and a New Jersey group had begun using the substance, and it was being investigated in England, Belgium, Italy, the Philippines, and Japan. Early results seemed to show Laetrile dosages could range up to 400 milligrams with no harmful effects and that intravenous injections brought better reactions than intramuscular ones did.

There were, then, several doctors actively using Laetrile in the United States. Efforts to secure grants from philanthropic institutions to pay for the Laetrile being used failed, so most of the doctors agreed to pay for production of their supplies. They also agreed to keep their work on the compound quiet since so much more needed to be known about it.

The expression "My God, it works!" uttered twenty years before when the original seed extract of the elder Krebs was found to be effective, was echoed many more times around the country about the purified extract. There was enthusiasm among the Krebses, their collaborators, and innovative doctors in the United States. Not only had the riddle of the cause of cancer been solved, they believed, but the weapon to combat cancer had been discovered and sharpened for use. They were ready to do battle against the Big C. But the clampdown on the new hope for cancer was not long in coming.

5

Officialdom's Response: Crackdown on Laetrile

The ever-recurring orthodox attack on Laetrile first took place in November 1952 in Santa Monica, where Dr. Harris had invited the chairman of the California Cancer Commission to take a look at Laetrile patients. As Glenn Kittler recorded it in *Laetrile—Control for Cancer*, the patients were not thoroughly examined and, worse, the opinion was expressed that patients benefiting from the treatment (a) had never had cancer in the first place, (b) were responding belatedly to orthodox surgical or radiation treatment, or both, or (c) were undergoing "spontaneous remission" or "regression" of symptoms.

These three arguments persisted through the legal battle of Laetrile as it collided with the mind of orthodoxy: it just *could not* work, so therefore any example of its seeming effectiveness must have come about for some other reason. Several doctors and officials persistently told me this during my own investigation, most of them being careful to add that they were not directly or entirely excluding the possibility of some Laetrile efficacy.

I wondered, had the AMA and FDA been aboard a ship in the early nineteenth century and a "quack" had suggested that British seamen could be spared the common and devastating condition of scurvy simply by sucking on limes, how far this theory would have been allowed to advance.

The terms "spontaneous remission" and "regression" are, after all, what the "counterculture" calls a "copout"—phrases suggesting that something has happened that no one understands.

It was not until March 23, 1953, that the California Cancer Commission, a department of the California Medical Association, held a press conference to announce that a thorough investigation of Laetrile had been made and that the compound was worthless. The "famous 44"—the cases the commission claimed to have investigated—set the primary basis for all subsequent orthodox thinking against the Krebs compound. In fact, it was still cited to me by

state public health department authorities as late as January 1974 as the best argument against Laetrile. But as the National Cancer Institute's cytochemistry chief pointed out: "The 1953 report of the California Cancer Commission . . . described no patient ever receiving a total dosage of Laetrile as great as is now the current standard *daily* dosage (3 gram/day or more)."[1]

The official conclusions of the California study read, in part: "The Commission has collected information concerning 44 patients treated with Laetrile, all of whom either have active disease or are dead of their disease, with one exception. Of those alive with disease, no patient has been found with objective evidence of control of cancer under treatment with Laetriles alone."[2] The way the last sentence reads to a layman, it could be inverted to suggest that "some patients have been found with objective control of cancer under various treatments, including Laetriles." This is a gratuitous interpretation, of course, but the semantics of the statement lead to some open questions.

The report is of utter importance in the Laetrile matter because it is the major foundation on which the future anti-Laetrile decisions rested. First, as the Freedom Newspapers found when they did the first, serious, in-depth study of the Laetrile phenomena in 1964, the nine physicians who formed the committee that ruled against the substance had no personal experience with Laetrile. Of the five surgeons, two radiologists, one pathologist, and one professor of medicine, not one had such experience.

It was not until ten years after the first report that more detailed information became available. Among the data: five patients had received only one injection, five had received only two.[3] The largest amount of Laetrile listed for any patient included in the 1953 report was 2 grams, 275 milligrams in twelve injections from September 26, 1952, to December 15, 1952.

The Freedom Newspapers probe noted, moreover, that the committee's initial study reports that a biochemist to whom Laetrile samples were submitted had found in an "inconclusive study" that he was unable to break down the material to release cyanide and that the results of the tests thus "do not support the claims made for Laetrile." Yet, the American Medical Association's chemical laboratory findings compiled two months before the date of the prior paper indicated success in releasing cyanide during tests with Laetrile. This information did not become public for ten years.

In the interim, media "exposés" of Laetrile—based solely on the incomplete, let alone questionable, 1953 California report—were made. But even a cursory perusal of the 1953 report left some room for educated doubt. For example, it included an interesting sentence reading: "Thus, all of the physicians whose patients were reviewed spoke of increase in the sense of

1. Dean Burk, letter to Rep. Louis Frey, Jr., May 30, 1972.
2. "Unproven Methods of Cancer Management—Laetrile," *Ca—A Cancer Journal for Clinicians* (American Cancer Society) (July-August 1972).
3. Jim Dean and Frank Martinez, "The Laetrile Story," *Santa Ana Register*, October 4-9, 1964.

well-being and appetite, gain in weight and decrease in pain, as though these observations constituted evidence of definitive therapeutic effect."[4] While this statement is susceptible of several interpretations, surely one of them is that the physicians interviewed (and apparently by the report writers, the late Doctors Ian MacDonald and Henry L. Garland, chairman and secretary, respectively, of the Cancer Advisory Council) spoke in favor of Laetrile—that is, *all* of them did, at least up to a point.

Attorney George Kell, defending Albany physician John Richardson on the "cancer quackery" charges, and also defending nutritionist Harvey E. Howard, convicted of practicing medicine without a license by dispensing Laetrile, relied to some extent on the arguments that just such evidences of well-being constitute the very evidence on which physicians rely in order to judge whether, for example, orthodox chemotherapy is worthwhile palliation.

The 1953 report, the keystone for all subsequent decisions and official opinions on Laetrile, had an ironic followup. Doctors MacDonald and Garland, also known for their research report on cigarettes that attempted to invalidate the U.S. surgeon general's report alleging that cigarette smoking causes cancer, died in presumptively smoking-connected ways: MacDonald in a fire caused by a lighted cigarette, Garland of cancer of the lung.[5]

In consequence of the 1953 report, the Laetrile program in the U.S. began to decline. Patients who said they had received help from the substance were not believed. And for most doctors the matter had been solved: Laetrile was one more quack cancer cure, at least in the United States. But abroad, things were happening: Dr. Manuel D. Navarro, professor of biochemistry and therapeutics at the University of Santo Tomás, Manila, Philippines, proclaimed Laetrile "the ideal drug for the treatment of cancer." And Dr. Ettore Guidetti of the University of Turin, Italy, reported on the beneficial direct application of Laetrile to cancer growths without having to perform surgery on patients. His report was a major disclosure at the International Union Against Cancer conference in Brazil in 1954.

It was Dr. Navarro who refined an important weapon in cancer detection: the Beard Anthrone Test (BAT), developed by Dr. Howard H. Beard but not granted the official blessing of American medical orthodoxy. The BAT is said to measure the amount of human chorionic gonadotropin hormone (HCG), appearing in both cancer and pregnancy, in the urine. It had been known that the HCG is broken up by the pancreatic enzyme chymotrypsin, and that it rises steadily in the urine of pregnant women until the fifty-sixth day, when it begins to decline, but rises steadily in the urine of cancer patients until death.

All these were essential points ranged around the trophoblastic theory of cancer, the effect of enzymes on cancer, and the efficacy of Laetrile. Dr. Navarro refined to a claimed ninety-seven percent accuracy Dr. Beard's test,

4. "The Treatment of Cancer with 'Laetriles,'" *California Medicine* 78, no. 4 (April 1953).

5. Letter, George Kell to R. K. Procunier, director, California Adult Authority, regarding prisoner Harvey E. Howard, October 16, 1973.

and the BAT, by positive and negative readings, is the primary measuring rod for Laetrile cancer therapy.

Despite the curtailing of Laetrile research in the United States, information continued to come in from abroad—England, Belgium, and Japan joining Italy and the Philippines as countries where professional, credentialed researchers were indicating the effectiveness of the substance. Soon, Canada became the focal point of interest in Laetrile, due directly to the intervention of the McNaughton Foundation, then based in Montreal.

Andrew R. L. McNaughton and his foundation (discussed more fully later) set up a network of Canadian scientists in liaison with the Canadian government for the official testing of Laetrile, with one savant after another noting and reporting on the effects of the compound. A particular champion was Dr. N. R. Bouziane, professor of pathology and biochemistry at the University of Montreal, dean of the American College of Bioanalysts, and director of research laboratories and chemotherapy specialist of Saint Jeanne D'Arc Hospital's tumor board in Montreal.

Testing and research went on quietly for two years, beginning in 1960. Enthusiasm rippled over Canadian medicine and it seemed that, at last, the answer to cancer had been found.

An American, Dr. John A. Morrone, attending surgeon at the Jersey City Medical Center, on the basis of research in Canada and meetings with Bouziane and Krebs, authored the first article on Laetrile patients in an American medical journal in 1962, the same year Ernst Krebs, Jr. prepared a lengthy report on his work for both the Canadian and the American food and drug administrations. In *Experimental Medicine and Surgery* (no. 4, 1962), Dr. Morrone, reporting on ten cases, noted a "dramatic relief of pain" in all ten after the first or second intravenous injections of Laetrile, with pain vanishing completely in five of the cases. In his summary, he noted pain relief, reduction of the obnoxious odor associated with cancer, improved appetite and reduction of swollen glands, all of which "suggest regression of the malignant lesion."

In the meantime, Judge W. T. Sweigert of the San Francisco Federal District Court allowed limited distribution of supplies of amygdalin (Laetrile) to the McNaughton Foundation in Canada and to several American physicians for investigation with or treatment of patients.

Whether Krebs would get anywhere with the American and Canadian FDAs in legalizing Laetrile for human use essentially turned on an amendment to the original U.S. Food, Drug and Cosmetic Act of 1938—the "Drug Amendment of 1962," known as the Kefauver Amendment, an outgrowth of the worldwide furor over the crippling drug thalidomide, whose sudden mass usage by pregnant women had left a trail of deformed babies. The amendment added the further requirement of demonstration of drug efficacy in addition to drug safety, a point later to be litigated.

The Food, Drug and Cosmetic Act uses the word "drug" to define any article "intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease." It is this clause that permits the FDA to brand a

food, a supplementary food factor, or a vitamin, a "drug," and to bring it within the federal capacity of classifying items as "new drugs." Despite growing evidence from researchers around the world, the U.S. FDA concluded in March 1963 that "the Food and Drug Administration has seen no competent, scientific evidence that Laetrile is effective for the treatment of cancer."

Earlier, Ernst Krebs, Jr. and the John Beard Memorial Foundation he had established in San Francisco pled guilty in U.S. District Court to five counts of violating the "new-drug" provisions of the Food, Drug and Cosmetic Act. A total fine of $3,755 was assessed. Imprisonment for Krebs Jr. was suspended and he was placed on three years' probation with the provision that he was prohibited from the interstate shipment of all new drugs, including Laetrile in particular, without a new-drug application from the FDA.

Also in 1963 the California State Public Health Department issued a report that essentially upheld the California Cancer Commission's 1953 study, and recommended that the use of Laetrile in cancer therapy be prohibited under the provisions of the 1959 state law that created the Cancer Advisory Council. The report concluded that " 'Laetriles' are of no value in the diagnosis, treatment, alleviation or cure of cancer."

Further, the report recommended that a regulation be issued prohibiting the use of "Laetriles" (that is, the beta-cyanogenetic glucosides called amygdalin and prunasin) or "substantially similar" agents for such purposes. The regulation was issued September 20, 1963, and became effective November 1, 1963.

With the FDA banning the interstate shipment of Laetrile and the California regulation banning the use of Laetrile in cancer therapy, the home state of Laetrile thus became the state where it was most vigorously opposed.

On May 15, 1965, the *Canadian Medical Association Journal* reported on research with laetriles and intriguingly concluded that "from the data obtained neither product [from Krebs or the McNaughton Foundation] can be considered as a palliative in cancer therapy on the basis of the biological rationale advanced by the manufacturer."

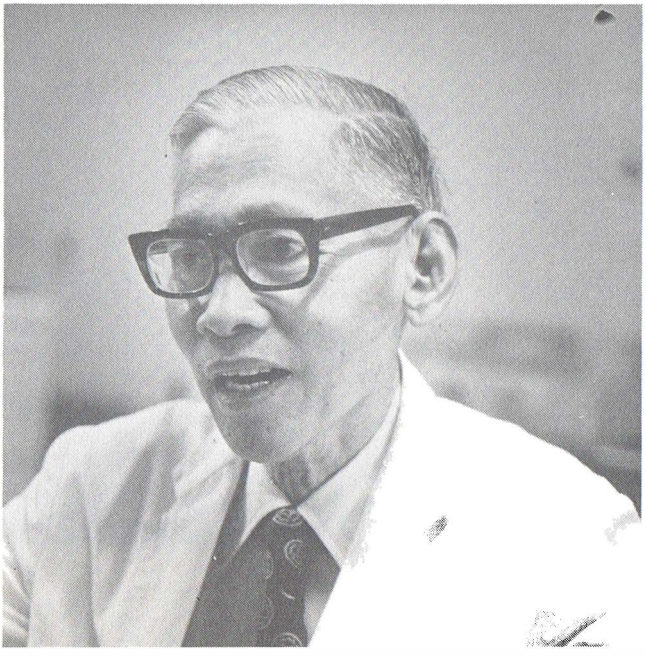
The McNaughton Foundation apprised the American Cancer Society in 1969 that information had been filed with food and drug officials in the United States, Canada, and Mexico in sufficient quantity and quality "normally . . . adequate for the release of a new drug for clinical testing in humans." It noted that in Mexico an independent preliminary evaluation of Laetrile patients had been carried out "under government auspices with most encouraging results." Indeed, Mexico was soon to become the new focus of Laetrile activity because of the murky legal situation surrounding the compound in the United States.

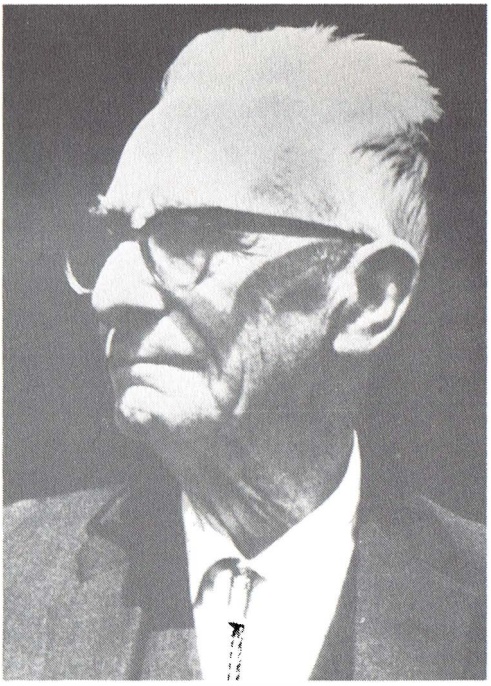
The various forms of amygdalin were enjoined from interstate commerce in the States when prepared as pharmaceuticals for human medical use—yet could be transported interstate when animal testing was the objective. Meanwhile, American doctors could not even insinuate that Laetrile was of any value in the treatment or control of cancer.

Laetrile (Vitamin B_{17}) in the making (top) **at the CytoPharma de Mexico laboratory in Tijuana. Bags of apricot kernels are brought to the warehouse. This natural material** (center left) **is ground and defatted with a cold solvent, and when the solvent is driven from the remaining ground pulp a completely fat-free powder** (center right) **which is partially soluble in water remains. The fat-free powder is then added to boiling alcohol** (shown below), **where amygdalin is extracted from the powder and the materials filtered. The filtrate that remains is placed in a freezing cabinet from which crystals of Laetrile are recovered. The process of recrystallization is repeated a number of times depending on whether the material is to be used for oral purposes or for injection.** (Mike Culbert photos)

Laetrile pioneer DR. ERNST T. KREBS, JR. (above) **A life-long commitment.**

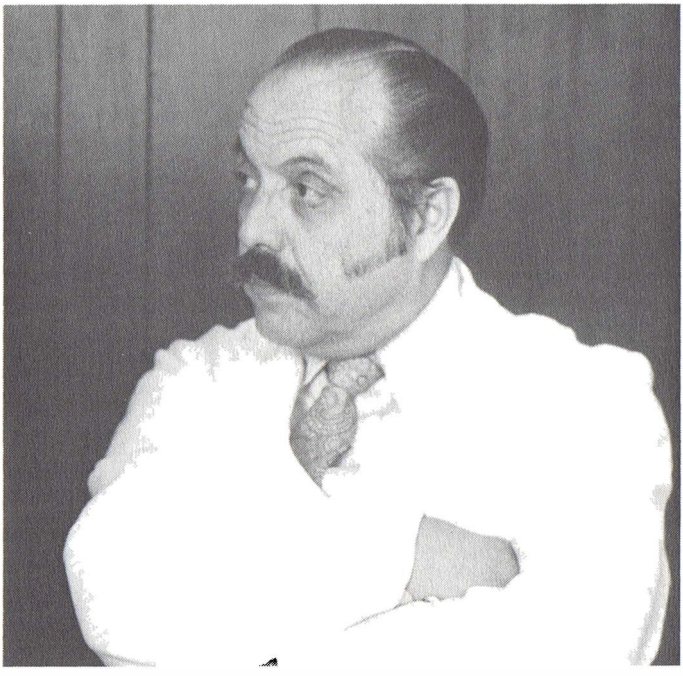
DR. MANUEL NAVARRO (below) **Major voice of vitamin B17 in Asia.** (Bill Haigwood photo)

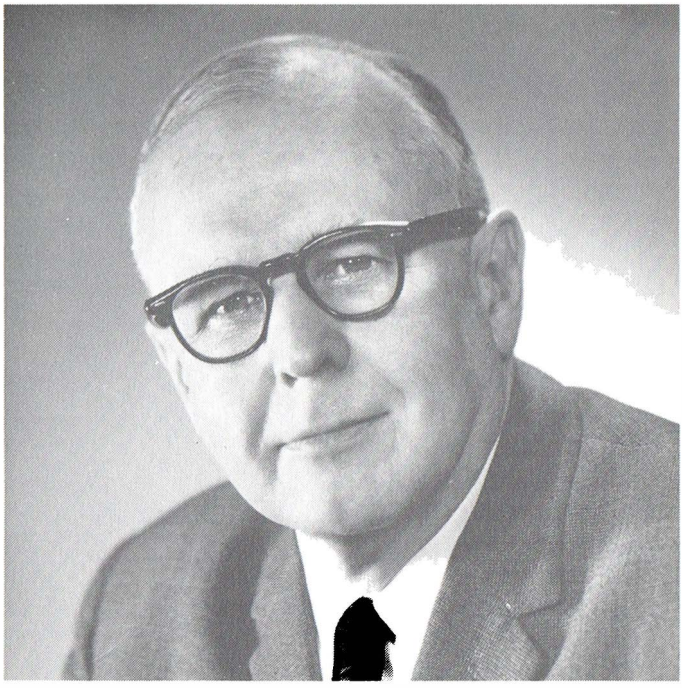




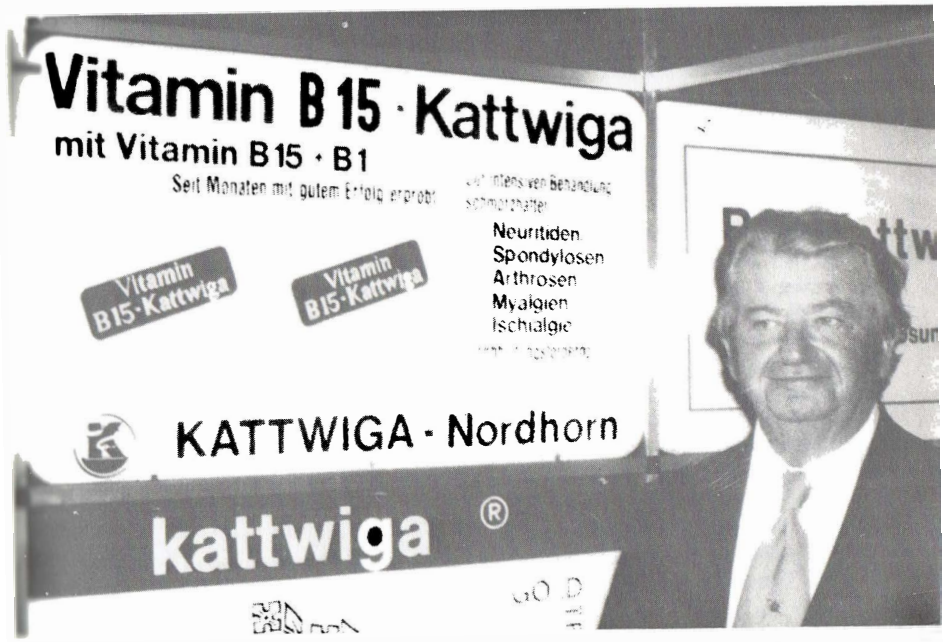
DR. ERNST T. KREBS, SR. (above) **He searched for an answer. DR. JOHN A. RICHARDSON** (below) **He dared to use Laetrile.** (Claude Daughtry photo)

ANDREW R. L. MCNAUGHTON (above) **Challenging the unknown. DR. ERNESTO CONTRERAS** (below) **Offering hope from Tijuana.**





DR. DEAN BURK (above) **A gadfly from within. JOAN WILKINSON** (below) **Amazing results with vitamin B_{17}.** (Simon Bailey photo)



ERNST T. KREBS, JR. Seen here in West Germany alongside a commercial touting of vitamin B_{15}.

On August 2, 1965, Ernst Krebs, Sr. agreed to a permanent court injunction against further distribution of the drug, and told the U.S. District Court in San Francisco that he was going out of business. According to the *FDA Report on Enforcement and Compliance*, September 1965, he also "pleaded 'no contest' to criminal contempt charges stating that he disobeyed a restraining order prohibiting shipment of Laetrile in interstate commerce.

"Since the restraining order was issued in May 1965, Dr. Krebs had shipped Laetrile to a hospital in Alabama and to doctors in Utah, Texas, and Washington."

The same report noted that the Canadian Food and Drug Directorate had taken action against the McNaughton Foundation in Canada, contending that the product it was sponsoring "was dangerous and did not meet the requirements of the New-Drug Act, which, similar to U.S. law, requires proof of safety and efficacy."

On January 21, 1966, Dr. Krebs Sr. pleaded guilty to a contempt charge of shipping Laetrile in violation of an injunction, and on February 3 he was given a one-year suspended sentence by the California U.S. District Court for failing to register as a producer of drugs—particularly Laetrile—coming under the "drug" semantics of the Food, Drug and Cosmetics Act.

The legal situation in the United States and Canada, which led the McNaughton Foundation to switch many of its activities to Mexico, by no means halted worldwide interest in the uses of Laetrile, or, as more familiarly known worldwide by its chemical name, amygdalin. At the quadrennial conference of the International Cancer Congress meeting in Tokyo, Japan, in 1966, the West German M.D., Hans Nieper, first learned about the Krebses' compound. Dr. Nieper began the administering of Laetrile in far greater doses than had been used by Dr. Krebs.

A one-time consultant on space metabolism for the National Aeronautics and Space Administration, the inventor of "electrolyte carriers," and a physician whose credentials include more than 200 published papers, Dr. Nieper embarked on a thorough testing of the compound. Ultimately he reported that Laetrile was effective in "a great number of patients" because it is nontoxic, can be used indefinitely, and does not "collide" with other types of treatment. He did not find it effective in brain tumor and severe metastasis of the liver.

Americans began going to West Germany in the late 1960s to visit Dr. Nieper and to be treated there. These included several very wealthy Americans, some of them wishing to remain anonymous. In New York, in 1972, I personally learned of two of the Nieper cases, one including a rapid reduction in a huge prostatic tumor on a man in his seventies. It was Dr. Nieper who treated comedian Red Buttons's wife before her dramatic announcement at the Los Angeles conference in 1973 that her once-terminal cancer was now "controlled" by Laetrile.

But the primary focus of attention for American cancer patients who sought Laetrile turned out to be Tijuana—a name, unfortunately, also associated with quickie divorces and cash-and-carry abortions. Dr. Ernesto Contreras, a grad-

uate of the Mexican Army Medical School who did postgraduate work in Boston, told me in an interview in his new clinic-hospital in Playas de Tijuana that he had learned about Laetrile "by accident" in the early 1960s when Mexican cancer patients had mentioned it to him.

I had interviewed two of Dr. Contreras's patients earlier—both former terminal cases and now Laetrile true-believers—and I expected to find in the gentle Mexican physician an outspoken Laetrile advocate. Instead, all Dr. Contreras was really prepared to say in interviews ranging from 1972 to 1974 was that Laetrile seemed to be the best of the medical agents available and that by no means was he buying the unitarian trophoblastic theory entirely, even though "that theory holds for ninety percent of the cases of cancer."

The clinic, which is daily filled with patients, most of them American, was operating on legal, if just barely legal, status in 1972, before Laetrile had secured the full official blessing of the Mexican government, which blessing it obtained in 1973. Californians spoke of the "Laetrile underground," whereby patients from throughout the country made the trip to Tijuana, usually via San Diego, or were otherwise able to procure Laetrile from Mexico.

Most of the Laetrile consumed in the United States was coming from a Tijuana laboratory. Costs of the substance were modest compared with prices for U.S. cancer drugs, and treatment and hospitalization in Tijuana were modest, too, even though the virtual monopoly of American terminal cancer patient traffic in Tijuana left many people with an assembly-line impression of the operation there. As of 1974, Dr. Contreras told me, about 1,000 new patients per year, or between 100 and 120 patients per month, were visiting his facilities.[6] The Mexican medic had a staff of ten, a much expanded practice, and spreading fame.

As of 1972, Dr. Contreras said he had personally treated 2,500 cancer patients in Tijuana since 1963 with Laetrile. That number had increased by several hundred by 1974. He emphasized that he tried, at best, to offer a "control"—never a cure—of the dread disease.

Far from rendering a blanket endorsement of what Laetrile could do, he said only sixty percent of those he had treated showed "response," ranging from a feeling of well-being and cessation of pain—elements consistently mentioned to me by a score of Laetrile users I interviewed over a two-year period—to the regaining of weight. He confirmed this percentage approximately when interviewed for the 1974 series in the *Rochester* (Minnesota) *Post-Bulletin*.

Few of his patients had undergone what Dr. Contreras termed "total control" of their cancers, forty percent had experienced no response at all, and of the sixty percent who did evince some benefit from Laetrile, almost half had had recurrences of the disease after its temporary arrest for three to six months. For this group, inability to arrest tumors or provoke their remission was typical,

6. In contrast with the 17,000 per year mentioned in the *Rochester* (Minn.) *Post-Bulletin* series of January 21-25, 1974, an otherwise excellent account of the Laetrile story. Several thousand more visitors over the border above and beyond the 1,000 new patients per year may be explained by "repeaters" returning for Laetrile supplies.

he said. For the remaining thirty percent, in the "more definite responses" category, results ranged from slight to the dramatic disappearance of all symptoms. A patient is considered "controlled" after five symptom-free years but remains on pill maintenance dosages for the rest of his or her life, much as a diabetic must remain on insulin.

Dr. Contreras said that two other Mexican doctors were using the compound for treatment in 1972, that one had had "fairly good" results in 120 cases in a Mexico City hospital but was "fearful to speak about them."

The salient characteristic about the Contreras therapy then (and the Richardson treatments later) is that eighty to eighty-five percent of his cases, almost all of them Americans, are terminal cancer patients—persons given weeks, months, a year at most to survive. The Mexican physician repeated the Krebs view that Laetrile is no miracle cure, that it cannot restore damaged tissues. All it can do, and even then not in all cases, is attack and destroy cancer tumors while allegedly building up the body's natural defenses against the disease. Noting that his therapy "may have saved five percent of the terminal cases I have seen," Dr. Contreras added that for the great number of other patients, months and even years had been added to their lives even though death eventually overtook them.

A case in point was one I monitored at a distance—that of a fifteen-year-old Hutchinson, Kansas, youth, who, on April 19, 1972, had been given three months to live. His parents were told that cobalt and chemical treatments would not correct his cancerous condition. Hearing of Laetrile, his family made several trips to Tijuana. Their return to Kansas in 1973 gave Laetrile a short-term splash of favorable publicity, since the boy's cancer seemed to be at least partly under control. He did die—in July 1973—but the key fact is that he had lived a year longer than orthodox medicine said he would.

The Contreras clinic and collaborating hospital were ever more in the news from 1970 on; the alternate successes and failures of patients headed for "the Tijuana connection" were monitored whenever possible. Most Contreras patients, following massive intravenous Laetrile injections, are sent home with Laetrile tablets and orders for a strict diet, since laetrilists regard the need for a select diet as virtually as important as the Laetrile itself. A slippage in diet was accompanied by a return of tumors in numerous cases I learned about.

The Mexican medic said there is no proof yet that Laetrile is a cancer preventative, but added that it "most probably" is. He soft-pedaled the preventative use of Laetrile, arguing that there was not yet enough of it even for all the cancer-sick patients.

He exhibited bitterness only when he expressed frustration over what he called "the FDA campaign against Laetrile." He asserted that "it meets all the requirements asked by the FDA [for clearance for human use]—they have all been filled by Laetrile." Federal officials continued to deny this, and even alleged that Dr. Contreras and his staff did not comply with requests to make available thorough, solid Laetrile case histories.

Contreras also wondered why the trophoblast theory of cancer was not routinely taught in medical schools. Embattled though he was in the United

States, the patient Mexican practitioner was "where the action was" in Laetrile through the late 1960s and early 1970s.

While Contreras's treatment continued to be known by word of mouth and intermittent press reports, the McNaughton Foundation continued to fight for permission to test Laetrile; its dossier was jammed with cases from many foreign sources, including the Contreras ones. The strange switch of 1970 then occurred.

In April 1970 the Food and Drug Administration assigned IND (Investigative New Drug) application 6734 to the McNaughton Foundation, based in California, to test amygdalin-Laetrile, a move which would have given the foundation permission to obtain supplies of the "investigational drug" and to initiate clinical studies. Then, ten days later, permission was suddenly revoked by the FDA, allegedly at the behest of the then surgeon general Jesse Steinfeld, a California physician involved in the California Medical Association ban on the compound in the 1950s.[7] Dr. Charles C. Edwards, FDA commissioner, stated on June 9, 1970:

> As with all "cancer" drugs the review of the IND was expedited. . . This review was completed on April 27, 1970, 21 days from the date of receipt. The review disclosed a number of serious preclinical deficiencies.
>
> On April 28, 1970, a 10-day pretermination notice was issued detailing the deficiencies in the notice, and the sponsor was notified by wire to immediately cease clinical studies. The sponsor was allowed 10 days in which to either request a conference or to correct the deficiencies which were brought to his attention.
>
> Since the sponsor did neither, the IND was terminated on May 12, 1970.[8]

This is the kind of statement tailored to enrage Dr. Dean Burk, Laetrile's single key friend inside the government structure. The head of the National Cancer Institute's cytochemistry division said in a May 30, 1972, letter to Rep. Louis Frey: "I may add that I have been reliably informed by the staff member in charge of handling IND applications in one of the largest cancer research organizations in the country that the McNaughton Foundation IND application 6734 is superior in content and extent to most all of the IND applications made by and granted to said research organization, and this in spite of the report of the 'kangaroo court and jury' of the FDA."

Dr. Burk, a thirty-four-year veteran of government service in his field, was the primary heavyweight to come over to the Laetrile camp from the very beginning, not because he thought Laetrile was the final answer or because of any devotion to the trophoblastic theory, but because he found his own testing of it on mice to be effective and "absolutely nontoxic." He battled for years against an orthodox medical and pharmaceutical establishment that promoted "official" but highly toxic anticancer drugs with low levels of success in therapy while consistently thwarting clinical testing on humans of

7. Don C. Matchen, "A New Look at Laetrile," *Let's Live*, June 1973.
8. Statement before the House Subcommittee on Intergovernmental Operations.

Laetrile and other allegedly nontoxic anticancer substances.

Backers, supporters, and users of Laetrile were once again puzzled, as were, finally, some of the U.S. media. If Laetrile was worthless, why not openly, officially, clinically test it on humans and find out? Were the reports of medical men like Contreras, Nieper, Bouziane, and Navarro really off-base? Were thousands of users deluded into believing they were having some relief with the apricot-pit extract? Yet, only silence greeted such questions, and more and more sustained Ernst Krebs, Jr.'s long-held thesis that the "chief harassment" against Laetrile emanated from state food and drug agencies at the behest of the FDA.

A 1971 television report on Laetrile about the time of the arrest of Krebs and four others, plus widespread attention given the Contreras clinic, nonetheless kept Laetrile alive as a growing news item, after years of its virtual suppression within the United States.

On September 1, 1971, the FDA said in a news release that an Ad Hoc Committee of Consultants for Review and Evaluation of Laetrile had found "no acceptable evidence of therapeutic effect to justify clinical trials" of the drug. The blue-ribbon panel[9] findings preceded the news release, which stated:

> Under the FDA position reinforced today by the Ad Hoc Committee findings, Laetrile (amygdalin) may not be promoted, tested or sold in the United States under provisions of the Federal Food, Drug and Cosmetic Act until the necessary basic studies have been accomplished.
>
> The FDA also has requested Dr. Ernesto Contreras, Mexico, and Dr. Hans Nieper, Germany, to provide any clinical records they may have on Laetrile treatments they have been giving patients.
>
> The FDA said the request was part of its continuing efforts to obtain scientific evidence to support claims by Laetrile advocates that the substance is an effective anticancer agent.

So the clampdown was official as far as the FDA was concerned. Empowered to rule on "new drugs," semantically equipped to regard a food used in the treatment of a disease as a "drug," and able to control interstate shipments, the FDA tightened the noose around Laetrile.

This was the background to the Richardson arrest and the mass proliferation of committees sprouting up primarily in California and then nationwide, arrayed around a single question: Why *not* test Laetrile? One government-baiting attorney, Washington's John Joseph Matonis, aiding several of the legal cases on several fronts, believed:

> The FDA's legal authority—if indeed it is legal—is unconstitutionally

9. Albert Segaloff, M.D., director, endocrine research, Alton Oschner Foundation, New Orleans; Melvin J. Krant, M.D., director, medical cancer unit, Tufts University, Medford, Mass.; David P. Rall, M.D., Ph.D., associate science director for experimental therapeutics, National Institute of Environmental Health Sciences, North Carolina; Michael B. Shimkin, M.D., professor of community medicine and oncology, University of California, San Diego; Julian L. Ambrus, M.D., Ph.D., director of cancer research, Roswell Park Memorial Institute, Buffalo, N.Y.

applied in the case of Laetrile and nutritional remedies for cancer. The FDA is unfairly discriminating against Laetrile by enforcing standards higher than those established for other drugs which are more in alignment with FDA's philosophy.

They say Laetrile is banned because it's not effective—which it certainly is—but then they allow a variety of other drugs that are extremely poisonous, and not necessarily effective.[10]

10. To Tom Valentine, *National Tattler*, March 11, 1973.

6

The Cyanide Hunters

Since the alleged action of cyanide is the presumptive retardant of cancer in Laetrile, and because free cyanide is indeed poison, American public health authorities have been able to frighten the public about Laetrile simply by using the word "cyanide" often enough. The fear of cyanide also underlay the official attacks—some seemingly with a touch of tongue in cheek—against apricot pits themselves and two nitriloside-bearing products called "Aprikern" and "Bee Seventeen."

Dr. Krebs and other researchers have noted the presence of cyanide in one form or another in many of the foods we eat. More important, it occurs very much in the early evolutionary process. Laetrilists were cheered to note that astronomers examining the passage of the comet Kohoutek in December-January 1973-74 detected as an "unusual" feature of the massive heavenly body the presence of hydrogen cyanide, cosmic proof-positive of the considerable cyanide presence in the formative processes of solar systems.

I wondered, at the time, if the presence of Kohoutek and the detection of hydrogen cyanide in the gigantic celestial wanderer were not somehow symbolic of the battles being fought on Earth over Laetrile, for its visible presence paralleled the months of extreme agitation, on the legal, scientific, and propaganda fronts, of the onrushing Laetrile battle.

While Laetrile was banned for sale at the FDA level not on the basis of toxicity but on the allegation that it simply is worthless as a cancer treatment, lower-level attacks by officialdom, usually thinly veiled, insinuated the danger of cyanide. ("Tests show that Laetrile is forty times as toxic when taken by mouth as when given by injection," noted the former executive secretary of the California Advisory Council in officially sanctioned material on cancer quackery.) No matter that the National Cancer Institute's Dr. Dean Burk routinely denounced these fears as baseless, styling the apricot-pit extract "less toxic than sugar." No matter that Krebs, as part of his voluminous

research on the nitrilosides and toxicity, found huge presumptive levels of tolerance for the poison—usually safe in nature's compounds—in animals. And no matter that not a single authenticated case of cyanosis fatality was known in the quarter century that Laetrile, in one form or another, has been used in humans.

The whole matter of cyanide in apricot pits or in other seeds or in Laetrile has been one of the major red herrings in the Laetrile story. McNaughton Foundation president Andrew McNaughton noted[1] that "after all, amygdalin has been around for at least 3,000 years—the ancient Chinese used bitter almonds, with properties similar to those in the apricot seed, as a medicine. But bitter almonds, by agreement with the U.S. Food and Drug Administration, are not on the American market because one of the elements is cyanide—and FDA thinks cyanide will kill you."

Which of course it can—if it's in free form and in a specific amount. But according to McNaughton, the developers of Laetrile, and the researchers on amygdalin around the world, cyanide naturally occurring in food is not dangerous. Primitive peoples who eat only natural, organic and "unfractionated" foods, they claim, daily take in anywhere from 250 to 500 milligrams of organic cyanide. But the natural cyanide—as is claimed to be the chemical case for Laetrile or any version of amygdalin—is locked in a sugar molecule. This natural cyanide, they say, is normal to human metabolism, and is found in over 1,200 unrefined foods and grasses. When eaten, an enzyme (rhodanese) is said to detoxify the cyanide and it is excreted through the body's normal processes.

The California pressure against the dispensing of apricot pits in health-food stores—and apricot pits were routinely sold in such stores as the Golden State led the nation in the health-food mania—paralleled the advent of the Richardson arrest and first trial. For a time, some health-food store operators simply removed their packages of the pits, the almondlike nuts broken out of the tough apricot seed, from front-room view to the back room. But by 1973 it became difficult to find such packages: obviously the gradual spread of fear was working.

In September 1972 the California State Department of Public Health issued a warning that the eating of apricot kernels might cause cyanide poisoning and even death. This came as health-food stores were selling the dry pits for $1 per pound and up.

I caught up with this particular ramification of the overall story on Monday, September 5, after a wire service had carried the "warning." It was based on the experience of an unnamed Los Angeles couple, who had reportedly gotten sick from eating a concoction of apricot pits mixed with dried apricots and distilled water, put through a blender, and left overnight. The reported illness preceded the health department statement and provided the immediate effect of bringing into question the cyanide content of apricot pits and of many other seeds. While Laetrile was not mentioned, the inference to

1. "Laetrile—An Answer to Cancer?" *Prevention*, December 1971.

be drawn seemed plain—for, again, the specific chemical action on cancer tumors claimed by Laetrile boosters is the release by a specific enzyme of the cyanide contained in the cyanide-benzaldehyde-glucose compound that Laetrile (or vitamin B_{17}, or amygdalin) is.

I immediately got hold of Dr. Ben Werner, the department's epidemiologist, and Dr. Ralph Weilerstein, then the department's public medical officer and an outspoken foe of Laetrile. "Death from this is probably rare, and even when it occurs may not be diagnosed as cyanide poisoning from overeating of such kernels," Dr. Werner told me.

I wanted to know, since the department was quoted in the media as implying the possibility not only of cyanide poisoning but also death, if *any* such cases had actually been discovered in California, let alone the United States. The answer from both men was that no cases of cyanide fatalities from eating apricot pits were known. Indeed, I was finally told, the suggestion of such fatalities came from a British medical journal referring to a vague case in Turkey more than a decade earlier involving symptoms "suggesting" cyanide poisoning. I was also referred to a British report on African tribes that consume large amounts of fruit kernels and are said to suffer the symptoms of cyanide poisoning.

Dr. Werner agreed that "not enough is known" about apricot pits and those of other fruits, except that "too many" might bring about symptoms of cyanosis. But no one seemed to know how many "too many" are.

I did not then, and do not now, scorn health officials for occasionally issuing unintentionally misleading statements about food. After all, the health-food craze was being revved up with a vengeance in the late 1960s and early 1970s, and was a major part of the "counterculture." That back-to-nature young people might be hurting themselves through consuming uncommon blends of unusual foods was not particularly surprising during the era of the demonstrably dangerous "macrobiotic diet" of certain Zen and allied cultists.

The official federal line on Laetrile remained: not poisonous, only worthless. Nonetheless, stimulus-response words like "cyanide" and "toxicity" kept cropping up in California health department discussions of Laetrile, reaching a point in 1973 in which a state medical journal article left the impression that a Laetrile user was literally taking his life in his hands by turning to the "worthless" substance.

Jay Hutchinson, who, like many Laetrile users and true-believers, tends to be fearless in his approach to medical orthodoxy, provided an anecdote to the California drive against apricot pits. Aware that the oft-described Hunza people of the "Shangri-la" valleys of the Himalayas under the protection of Pakistan are vigorous consumers of apricots in every form, Hutchinson, speaking for the current signature campaign asking the White House to test Laetrile, addressed the royal Mir and Rhani of Hunzaland thus in an airmail special-delivery letter:

> I am rushing this extremely urgent warning to you so that you can take im-

mediate steps to notify your government and your people of the health hazard reported by the California State Department of Public Health during the week of September 3, 1972.

I enclose articles from San Francisco newspapers . . . it is obvious that this is serious and that no humor was intended (we have heard that you and your wife, the Rhani, have a great sense of humor).

As you can see this is not the time for humor—rather, it is a time for action. Mir, you must get your people to stop eating those pits! Stop making flour out of them! Stop feeding your newborn infants the oil, and for Mohammed's sake, stop anointing them with it!

I feel certain that the California State Department of Public Health (fraud division) would provide you with copious data proving you have been poisoning yourselves these many hundreds of years!

Please write soon, and when you do, would you mind telling us why your people are among the healthiest in the world, and why your men and women live vigorous lives well into their 90s, and why you and your beautiful people never get cancer?

Renee Taylor told of the amazing health, vitality and longevity of the Hunzakuts in *Hunza Health Secrets*. In it she recalls how the Hunzakut women found a supplementary source of fat in milk-scarce Hunzaland in the seed of the apricot, and how the knowledge of how to use it had passed from mother to daughter down through the centuries.

"Since apricot oil is so essential for their diet, every farmer grows more apricot trees than any of the other fruit trees," she wrote. "It is even said that the maiden's choice of a husband depends on how many apricot trees he owns." She added, "Today the apricot is not only the most popular fruit, it is also the most versatile. Its oil is used in cooking, salad dressings, as a food supplement and for medicine, and it is even used as a cosmetic on their skin and hair. Men, women and children use this oil, and it is obvious that it brings excellent results, as most all of them have beautiful skin and lovely hair."[2]

She describes how apricots are made into paste, jam, bread, and juice, and how it is common for the Hunzakuts to eat apricots, crack open their seeds with their teeth (no mean task), consume the pits within, and "be satisfied."

Despite reports that Hunzaland is not really all the utopia some dreamers claim it to be and that some cases of Hunza cancer have been noted, Prince Mohammed Ameen Khan, son of the Mir, stated flatly to the *Los Angeles Times* on May 6, 1973, that "cancer is unheard of" in Hunzaland.

Retained by the California state apricot industry as a consultant, the twenty-three-year-old prince said the Hunzakuts, whose average life expectancy is eighty-five, eat fresh apricots three months out of the year and dried apricots the rest of the time, also "relishing the apricot nut inside the kernel." Moreover, the people of this remote, 200-by-three-mile valley, 8,000 feet above sea level, drink apricot juice and cook with apricot oil.

A problem that Laetrile supporters grappled with for some time was how to get the substance out from under the onus of "drug" classification. Their

2. Renee Taylor, *Hunza Health Secrets* (New York: Award Books, 1969).

view is that Laetrile is a vitamin, a food factor, and should be treated as such. So in 1973 two products bearing the substance designated vitamin B_{17} were introduced into the California market and spread across the country: "Aprikern," put up in capsules, and "Bee Seventeen," a powdery, milkshakelike product. The food distributors did not seek to hide the fact that their products were indeed a form of edible Laetrile.

After months of circulation of the products in various states, during which, it was claimed, three million capsules of Aprikern and 100,000 packages of Bee Seventeen were sold, the FDA finally struck. On November 23, 1973, Sam D. Fine, the FDA's associate commissioner for compliance, informed Alex Geczy, president of General Research Laboratories, Van Nuys, California:

> Sample analysis by the Food and Drug Administration of your Aprikern capsules and "Bee" Seventeen product reveals that each contains hydrogen cyanide in such quantities that they are dangerous. For example, Aprikern capsules were found to contain an average level of over two (2) milligrams hydrogen cyanide per capsule. At that level, the ingestion of only five (5) capsules could be fatal to a child due to cyanide poisoning. Twenty (20) capsules could be fatal to an adult. Oral toxicity studies performed on rats support these figures. Likewise, we estimate that the contents of only two (2) packets of the "Bee" Seventeen product could be fatal if ingested by a small child.
>
> Due to not only the inadequacy of the labeling, but also the inherent danger these products pose both to children and adults, forthright action must be taken.
>
> Therefore, in the interest of consumer protection, it will be necessary to completely recall both the Aprikern capsules and the "Bee" Seventeen product from consumer channels.[3]

The ordering off the shelves of such products got under way in California, New York, New Jersey, and Minnesota. The distributors of the products charged "harassment." General Research Laboratories' attorney Stephen Tornay of San Diego argued that the new FDA move was in reality a veiled new tactic against Laetrile and that the federal agency "has no court order and no scientific findings as a basis on which they make assertions."[4] Moreover, Tornay said he had received ambivalent statements from the FDA as to what the scientific basis for the clampdown against the two products was.

The National Cancer Institute's Dr. Dean Burk jumped into the battle almost immediately. He consulted all concerned, including the College of Pharmacy, University of Arizona, scientists under whose responsibility the tests of the two products were carried out. In a letter to Geczy, Burk said:

> In my opinion, the FDA and FDA-derived press reports that Aprikern capsules contained on the average over 2 milligrams of hydrogen cyanide per capsule are grossly in error, and, as reported by the FDA, are both highly misleading and indeed fraudulent with respect to alleged danger to humans eating the capsules.

3. Copy of letter with the author.
4. *Berkeley Daily Gazette*, November 3, 1973.

The FDA-controlled analyses for hydrogen cyanide were carried out . . . according to the standard Official Methods of the Association of Agricultural Chemists, 11th Edition, p. 438, Analysis No. 26-065. . . . Ten to 20 grams of Aprikern (10-20 capsules) were ground to pass a No. 20 sieve and added to a closed-off 800 cc Kjeldahl flask containing 200 cc (neutral) water, allowed to stand 2-4 hours, then steam-distilled into 150-160 NaOH solution and titrated for hydrogen cyanide with Ag NO_3.

In other words, the hydrogen cyanide was measured only *after* several hours of neutral hydrolysis in a large volume of water, under a set of conditions ordinarily never met with in the swallowing of Aprikern capsules by humans, including the condition of stomach acidity precluding enzymatic hydrolysis of amygdalin by beta-glucosidase contained in the Aprikern but promptly destroyed by the stomach acidity.

In point of fact, as I have found in my laboratory, the amount of hydrogen cyanide, as such, in Aprikern capsules is negligible in terms of the amounts alleged by the FDA. Thus, the theoretical calculations of the FDA as to the number of capsules that "could be fatal" to adults or children (allegedly 20 and 5 capsules, respectively), based on alleged contents of hydrogen cyanide in the capsules, are scientifically unwarranted.

Moreover, these calculations are not backed up by human experience. Three million capsules of Aprikern have already been sold (and 100,000 packets of Bee-Seventeen) without report of notable toxicity, let alone lethality. To be convincing, in a "non-Watergatean" sense, the FDA would have to produce well-authenticated instances of harm of Aprikern to adults or children; otherwise, its theoretical calculations remain administrative humbug. . . .

The FDA-controlled experiments with rats . . . involved taking the Aprikern material *up in water* for as much as twenty minutes and then feeding such hydrolyzed materials to rats, with lethality then occurring at near 2 gram Aprikern/kg mouse, which would be equivalent to a 150-pound man eating about a third of a pound (or 140 capsules) of Aprikern on an equal kg basis. . . . But here again this applies only to hydrolyzed and autolyzed Aprikern prepared *prior to ingestion* by mouth. Long before a human adult or child could do this, he would be warned by the bitter taste of any such brew, just as he might be warned by the heat of a fire not to continue putting his hand in the fire. . . .

If such excellently nutritious food as Aprikern were to be recalled from consumer channels, as Mr. Fine's letter indicates, then to avoid discrimination, this might well be equally true of meat, milk, eggs, gelatin, and a great variety of protein-containing foods, all of which have long been known to produce hydrogen cyanide *when acted upon by suitable catalytic or enzymic agents* (bacterially or fungally derived) just as in the case of Aprikern, but under conditions . . . *not ordinarily involved* in human usage and consumption.[5]

Nonetheless, the propaganda damage was done and many health-food store operators went along with the clear-the-shelves pressure of the Food and Drug Administration. As of April 1974, Aprikern and Bee Seventeen were still off the shelves.

Aside from the protestations of Dean Burk and the extensive research done by Ernst Krebs, Jr., substantial modern research has tended to bear out the nontoxicity of amygdalin, the chemical name for Laetrile. German researcher

5. Copy of letter with the author.

Herbert M. Summa's 1972 study, with forty-two citations of scientific research papers, states: "Amygdalin is not toxic and has no negative side effects. It may therefore be administered over [a] long period of time."[6] Such statements collide directly with those of California public health spokesmen, who have suggested a danger in Laetrile due to presumptive toxicity. Again, however, the primary American arguments lodged against amygdalin therapy in cancer treatment are not that the chemical is toxic—simply that it is worthless.

6. Herbert M. Summa, "Amygdalin, A Physiologically Active Therapeutic Agent in Malignancies," *Krebsgeschehen* 4 (1972).

7

That Astounding Vitamin: B17

By the summer of 1973, with news breaking on several fronts at once, the media again began to take note of Laetrile—but this time in conjunction with a host of concerns and fads popularized by the return-to-nature craze. Nutritional approaches to health and medicine and belief in the superior value of whole foods were not new, of course; but when coupled with the fresh interest in vitamins and "natural" approaches to therapy, they tended to take on a new dimension. Laetrile, the "natural" answer to cancer, became part of the scenario. Hence the significant, if amusing, coalition of counterculture and more traditional interest in the substance.

It was perhaps the readiness of antiestablishmentarians to lump vitamin B_{17} in with everything else of a seeming unorthodox measure in the fight for good health that led Ernst Krebs, Jr., addressing that summer's Los Angeles conference on nontoxic cancer remedies, to warn of "heresy"—that is, departure from the strict Laetrile line in dealing with cancer. I had come to know and appreciate the intellect of this San Francisco scientist over the several years I was involved in the Laetrile story, and I was fully aware that in his mind Laetrile and indeed the whole question of cancer took on something of religious significance. Krebs remains the most forthright, convinced exponent of the Beardian theory and champion of the vitamin-deficiency nature of cancer.

At his San Francisco mansion during one of the many memorable interviews in which this voluble savant in his sixties spoke nonstop on the theory, nature, and solution of cancer, he said: "Laetrile needs true-believers—men moving ahead unequivocally toward a single goal." But he cautioned: "Remember, cancer is the last bastion of religious thinking—and anything is phony that won't stand the examination of a six-year-old boy." This was his way of summing up what he considers to be the illogical thinking of orthodox science in treating the cancer problem, one which he sees as basically simple, whose solution is found in the "universality of things."

The biochemist who taught himself several languages in order to read every extant document about amygdalin and the pancreatic enzymes approach to cancer has difficulty in articulating, for the layman, not only the specifics of Laetrile therapy but the mental motivation behind its discovery and use. But he took special pains to put forward his point of view to me, and it ran this way:

"The most open-minded, free-wheeling soul in the world will go up the wall if you tell him cancer is a specific vitamin-deficiency disease. And it took us thirteen years to realize that Laetrile is a new vitamin—B_{17}.

"So much a part of our thinking is that cancer represents a cell that must be killed. How can something nontoxic affect a malignant cell? To date, our cancer approach has been a drug approach—kill it, cut it, blast it out.

"What we are saying is that Laetrile is an antineoplastic vitamin, that vitamins are part of the universality. The mind has a psychological incapacity to determine how cancer can be caused not *by* something but by a *lack* of something, in this case, vitamin B_{17}."

Krebs Jr. spent much of the 1960s elaborating the vitamin approach to Laetrile and cancer, and how they relate to enzymes, prevention and "control." He explained that the "first line of defense" against cancer is an intrinsic factor—"the totality of the pancreatic enzymes" and supporting immunological system of the body. These systems are influenced by vitamins and diet in how they operate. Processed foods, particularly refined sugar, play a role in weakening these systems, he asserted. The "second line of defense," which becomes the primary one when the "first line of defense" is weakened, constitutes the extrinsic factor, what Krebs calls vitamin B_{17}, "the surveillant antineoplastic vitamin."

I asked him several times if, in his view, he believed that a sufficient quantity of the "extrinsic factor" would work to prevent cancer even though the "intrinsic factor"—again, the enzymes and immunological system—continued to be weakened and an individual compounded the problem by persisting in noxious habits, say, smoking.

Yes, said the biochemist, "clinical cancer" would probably be prevented with enough vitamin B_{17}. That does not mean a person would *not* have cancer, which, if the Beardian theory holds true, is simply the appearance of trophoblast in the wrong place at the wrong time. What it means is that even if cancer developed time and again, the "second line of defense"—the nitrilosides (Laetrile, amygdalin, vitamin B_{17})—would be doing its job in continually inhibiting tumor growth. Hence his view that cancer is at root a vitamin-deficiency disease—both in the way the totality of vitamins and diet affect the pancreatic enzymes and the immunological mechanism and in the way removal of a natural-food factor from Western diets by food refining and processing has virtually left the body defenseless against the proliferation of cancer.

If the premise is ceded that cancer, like scurvy, rickets, pellagra, beriberi, and pernicious anemia, is a vitamin-deficiency disease, the next step is to demonstrate it. Krebs's extensive research points to Western "progress"

in agriculture and food processing as the primary culprit in the cancer picture, for it has removed vitamin B_{17} in substantial amounts from the food we eat. He noted that a primary source of vitamin B_{17} is millet. "Yet we abandoned millet and went on to wheat. And we quit eating the seeds of common fruits as our affluence grew."

In unison with the natural-foods school, Krebs notes that animals instinctively consume whole seeds and fruits—and also instinctively turn to the natural plants and grasses they need when they feel ill. The San Franciscan ticked off maize, sorghum, field beans, lima beans, kidney beans, cassava, lettuce, linseed, and almonds as abundant sources of nitriloside, along with cherries, prunes, plums, pears, and all fruit seeds. Laetrile was first processed from apricot pits, and still is, but cherries may prove even more abundant in B_{17}, he believes. And he referred to a Nigerian study on an African tribe that consumes copious amounts of cassava daily and appears to be "immune" from cancer.

While the modern experience of the Hunza people tends to bolster the natural-food approach to medicine in general, and the considerable consumption of apricots by those people tends to support the Laetrile theory in particular, Krebs has assembled a considerable backlog of data to underscore these premises:

1. Cancer is essentially a disease of civilization—that is, its incidence is high in the allegedly "civilized" countries, and diminishes as peoples decline on the "civilization" scale.
2. The primary variable in "uncivilized" habits is diet.
3. In the case of cancer, we are dealing with a specific vitamin-deficiency disease, and the specific deficiency is of vitamin B_{17}.

He is fond of pointing to the fascinating data assembled by Vilhjalmur Stefansson in *Cancer: Disease of Civilization*, which appeared in 1960 and was a compilation of data on "primitive" peoples of both hemispheres to support the theory that cancer and diet are somehow linked. The writer did not leap to the nitriloside conclusion, but he left a considerable door open to it. A search of the documentation of missionaries, whalers, explorers, and government agents in Alaska led Stefansson to report that cancer was simply unknown among "uncivilized Eskimos" at the turn of the century, and that incidents of it did not even show up until into the third decade. Indeed, he reported, the Prudential Insurance Company of New York stated as fact in 1915 that "uncivilized people (such as the Canadian Eskimos) have little or no cancer." This statement produced no wonderment in 1915. Yet in 1956, such a statistic startled practically everybody when the *Canadian Medical Association Journal* reported it, he wrote. He quoted a U.S. War Department *Arctic Manual* statement in 1940: " 'Cancer has not yet been reported from uncivilized Eskimos.' "[1]

It intrigued Stefansson and medical researchers that the Eskimos had a very

1. Vilhjalmur Stefansson, *Cancer: Disease of Civilization* (New York: Hill & Wang, 1960), p. 72.

meaty and vegetable-deficient diet. Yet, they noted, such "primitives" as the Hunzakuts had a very vegetable-prone diet with minimal meat intake. Both were essentially cancer-free. Hence, the question of vegetarianism versus meat consumption did not seem to arise regarding cancer.

For Dr. Krebs, the difference is irrelevant. What is important, he believes, is the nitriloside-rich grasses consumed by the animals that the Eskimos eat; and the nitriloside-rich fruits and seeds—most particularly apricots—that the Hunzas consume.

In a John Beard Memorial Foundation memorandum to the National Cancer Institute's Dr. Dean Burk, Dr. Krebs referred to a United Press summary (February 1949) of a five-author paper in the *Journal of the American Medical Association* on why there are so few cases of cancer among Hopi and Navajo Indians. The memo read in part: "The Indians' diet seems to be low in quality and quantity and wanting in variety and the doctors wondered if this had anything to do with the fact that only 36 cases of malignant cancer were found out of 30,000 admissions to Ganado, Arizona, Mission Hospital.

"In the same population of white persons, the doctor said there would have been about 1,800."

Concluded Krebs: "In the Navajos there were 36 cases of cancer where there should have been 1,800—or only 2 percent of the expected number. At the time of this study, the incidence of cancer in rural white populations as compared to urban ones was 70 percent.

"The rural white population had a 'better' or larger and more calorific diet. It differed from the Indian population in lacking the vitamin B_{17} or nitriloside found in the diet of the Indian population."

In a paper prepared for the McNaughton Foundation and researching nitriloside consumption by man and animals, Krebs called attention to the "relative freedom of wild and most domestic herbivores from cancer as contrasted to its higher incidence among at least domesticated carnivores." A spectacular case in point, he said, was the cancer incidence among bears in the San Diego Zoo. He claimed five had died in one grotto there in the last six years—all of cancer of the liver and all after having been given "a diet almost completely free from nitrilosides."[2]

The nitriloside content of pasturage, fodder, and silage is "often striking," he said, noting as "common and often rich sources of nitrilosides" white clover, alfalfa or lucerne, vetch, certain millets, Johnson grass, Sudan grass, Arrow grass, the various sorghums, lupines, broad beans, velvet grass, and at least eighty other grasses, and the leaves of *Rosacae* and berries. Indeed, the two most common of the pasture grasses, Johnson and Sudan, often carry as much as 15,000 to 20,000 milligrams of nitriloside per kilogram of dry grass, thus offering a diet spectacularly heavier in vitamin B_{17} than that available to *Homo sapiens,* he said. Krebs called the incidence of

2. Ernst T. Krebs, Jr., "The Nitrilosides in Plants and Animals," in *The Laetriles—Nitrilosides—in the Prevention and Control of Cancer* (Sausalito, California: McNaughton Foundation, ca. 1967).

cancer in domesticated horses "reasonably high, though no formal statistics are obviously available."

Krebs has little patience with opposing views as to the cause, nature, and control of cancer. In one of our interviews, he said: "Look, there is the highest increase in cancer in the history of mankind. If it continues it alone will take care of the so-called population explosion. There is an identical growth rate in cancer all around the Western world—and those places where Western nutrition has gone."

Defending the view that "cancer represents a local manifestation of a systemic disease," and that viruses and poisons, however much they may "organize" cancer, by no means "cause" it, Krebs described the action of Laetrile as a magnet aimed at pulling out metal pellets embedded in the body. "Just assume the body is loaded with these pellets, which may be anywhere. Along comes a magnet to pull them out. According to where the pellets are in the body, the patient will die, or improve, or recover from the process." Hence the reason for dead Laetrile patients as well as living and only partly recovering ones, he said.

The ever-recurring question on my mind to all concerned in the Laetrile battle was this: If there is evidence, even fragmentary evidence, of at least partial efficacy through use of Laetrile, then why the obvious suppression of it?

"The anti-Laetrile campaign seems to be inspired by sheer, naked terror, for Laetrile represents the most terrifying possibility in medicine—a time when we could no longer say of cancer, 'we'd better go in there and cut it out,'" said Krebs, who exhibits most emotion when explaining why his has been an uphill battle. The *crème de la crème* of medicine is surgery, said Laetrile's pioneer. Surgery would be dealt a setback if it became commonly known that the solution to cancer is diet, not the surgeon's knife.

"The U.S.A. has more moron factories—the universities—than anywhere else in the world," he said, criticizing a seeming disinterest on campuses in looking into the dietary approach to cancer. He termed the American Medical Association and Food and Drug Administration "closed systems—blind, unconscious, but not consciously evil. If we were making progress in cancer why is one person out of three dying from it? If you bring in Laetrile you've eliminated the department of tissue pathology, therapeutic radiology, and will have made one hell of a dent into surgery." Both "billions of dollars at stake" in cancer therapy as presently practiced and "fantastic ego considerations" of scientists and bureaucrats committed to a faulty premise are at the root of the attack against Laetrile, he believes.

The "chief harassment" against him in California came not so much from the FDA itself as from the State Department of Public Health, he said. But nationwide it was the FDA that remained "on the trail" of Laetrile movements across state lines. The FDA, he believes, is strongly influenced by lobbying groups such as the AMA, American Cancer Society, and the producers and suppliers of X-ray equipment and the officially okayed anticancer drugs. The FDA represents a bureaucratic implementation of these pressures, he believes.

Notwithstanding the climate of hostility, the student who turned from medicine to biochemistry and physiology has put together a "Laetrile team"—between 125 and 150 noncancerous people from around the world who are regularly using Laetrile to provide support for his contention that enough daily intake of B_{17} acts as a preventative against cancer. "They have never developed cancer—not one. Naturally, if they did, the whole thing would collapse," he said.

It is Krebs's view that the Hunzakuts get as much as sixty milligrams per day of nitriloside (B_{17}), while the U.S. population may be lucky to get that much per year. If adequate intake of B_{17} is a prevention against cancer, as may very well be the case, the specifics of exactly how much per day is needed have not been worked out. But Krebs can't be faulted for not trying. He has worked out menus for breakfast, lunch, and dinner intakes of nitriloside, presumably in amounts sufficient to fall within the range of cancer prevention.[3]

His many battles for the recognition of Laetrile brought Krebs into an assessment of the role of bureaucracy in medicine, and he is as adept at reeling off the facts and figures of medical red tape as he is in discussing the unitarian or trophoblastic theory of cancer. He has observed, for instance, that in the Free World the United States is far and away the leader in paperwork needed to license a drug. He told me in 1972 that it takes 72,200 pages of printed material to license a drug in the United States, followed by Canada with 67,128 pages. He dares suggest that the increase in the death rate for American males, for example, runs parallel to the increased bureaucracy over the licensing of medicines.

By 1973 he was not alone in his assertions. In the October 1973 *Reader's Digest*, an article[4] unearthed these enlightening statistics:

- Since 1963, not a single new general-purpose medicine has been introduced in the United States to treat hypertension, even though twenty-three million Americans are affected by the disease. Yet between 1967 and 1971 five such drugs came into general European practice.
- In the same period, ten medications to treat irregular heartbeat came into the market in Europe, yet by mid-1973 only one of these had been approved for U.S. usage.
- At least seven new medications for asthma were introduced in Europe in 1962. By mid-1973 only two could be prescribed in the U.S.A.

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3. Concretely, suggests Krebs, the following should provide 300 milligrams per day of vitamin B_{17}, if adhered to with some consistency:

BREAKFAST—Gruel of buckwheat, millet and flaxseed, with elderberry jelly on millet toast, all of this accompanied by stewed apricots.

LUNCH—Lima beans or a succotash with chick peas; millet rolls with plum jam; elderberry wine.

SUPPER—A salad with bean and millet sprouts; dinner rolls of buckwheat and millet sweetened with sorghum molasses extracted from sorghum cane; rabbit which, one hopes, fed on clover; an after-dinner apricot, peach, cherry, or plum brandy originally prepared from crushing the whole fruit.

4. Walter S. Ross, "The Medicines We Need—But Can't Have," *Reader's Digest*, October 1973.

• A study conducted by the University of Rochester's Dr. William Wardell found that of the eighty-three new medicines adopted in both Britain and the U.S. between 1962 and 1971, more than half were introduced first in Britain—and an average of 2.8 years elapsed before the FDA allowed them to be sold in this country.

He also found that during that time Britain had approved for prescription about eighty medications that cannot be prescribed in America, including several that British physicians rate superior to anything available in this country.

At the root of much of the problem, of course, is the already mentioned amendment of 1962 to the Food, Drug and Cosmetic Act, legislation requiring that a drug must be proven both safe *and* effective before it can be licensed for use on humans. The article quoted pharmacologist Dr. Louis Lasagna: "You need only a small amount of good clinical work to establish that a drug is effective and reasonably safe. It seems wasteful to spend years getting more data just so people can have a spurious sense of confidence." The fact is that no medicine can automatically be assumed safe for people because it passes tests on animals.

Aside from his fisticuffs with the FDA over bureaucracy, regulations, and licensing, Ernst Krebs, Jr. has also fought a holding action over another substance he and his father pioneered: pangametin, or pangamic acid, which he baptized vitamin B_{15}, an accessory food factor. In 1973, this item remained in a bureaucratic limbo imposed by the FDA in the United States, yet it was being extolled in the Soviet Union as a breakthrough in medicine.

In June and July, the *Journal of the American Medical Association* twice reported on Soviet successes with the substance, which was developed, championed, and revealed to the world by the Krebses. In the July 23, 1973, *JAMA*, it was noted that "another vitamin, synthesized by Prof. (Vasili) Bukin earlier, is vitamin B_{15}; this chemical entity aids in stimulating oxidative processes and energy exchange. It aids in delaying development of atherosclerosis in the aging individual, says Dr. Bukin." It was, of course, not Prof. Bukin who developed the vitamin, but the Krebses; Krebs Jr. has come to believe the Biblical aphorism that a prophet is without honor in his own country.

In the matter of vitamin B_{17} (Laetrile, nitriloside) Krebs has emphasized the *natural* approach to cancer. He told the San Francisco Vegetarian Society for Health and Humanity in January 1974: "We look forward to the time when we won't have Laetrile as such. We will rely upon foods rich in vitamin B_{17} and the medical use of the material will no longer be necessary."

To the audience of vegetarians and natural-food champions, Krebs delivered the composite vitamin B_{17} philosophy: The process of regeneration is natural and normal to the animal organism. The trophoblast, be it uterine or extragenital, is a natural part of the life cycle and it is naturally inhibited within that cycle. Vitamin B_{17} is the naturally selected controlling, extrinsic antitrophoblastic factor, and the environment in which primitive man flourished was rich in vitamin B_{17}-containing foods. He turned to these foods for a variety of reasons just as sick animals today spontaneously seek out vitamin B_{17}-bearing grasses.

The reason why cancer has not been bred out of the human race through evolution, the biochemist told his audience, is that everyone develops cancer in the course of his life many times but it does not come to the clinical level because the intrinsic elements—the pancreatic enzymes and immunological system—are functioning.

He warned his audience about the "delusions of returning to nature by eating whole wheat or grains only, as they are deficient in vitamin B_{17}." Harvesting and cooking grains are, relatively speaking, only recent developments in man's history—of the two to three million years of the evolution of the presumptive primate stem from which man springs, "it has only been about 6,000 years that man has ceased getting his vitamin B_{17} from the sprouts rather than from the (for example) dried lima or dried mung beans. Man's forebears were getting concentrations of vitamin B_{17} eight to ten times greater on the basis of the weight of the original food than we get," he said.

For one gram of (for example) dried mung beans, the modern human receives perhaps only one percent of the vitamin B_{17} that man's forebears received when they ate such beans in the sprouting stage, Krebs pointed out. He went on to state that this is one reason for the fulminating dietary deficiency across the board and that it is the height of human egotism to assume that the culture of civilization, in a few thousand years, has built in the answer to the problems of deficiency that affect the living machinery. "We have had this profound deviation from biological experience and we're suffering the consequences of it, and when you return to sprouting, you go in the direction of correcting the consequences of this aberration," he insisted.

"We are well advised to eat as broad a spectrum of vegetable food as we possibly can, to eat it as fresh as we can get it, to eat it in its sprouting state if we can get it, and above all, to eat it whole. And if we do that then we are infallible nutritionally, then we can say the Food and Drug Administration is correct when it says that the normal diet requires no supplementation. That would be the normal diet and it would not require supplementation," he argued.

Officialdom and orthodoxy, of course, have not yet accepted either amygdalin or the beta-cyanogenetic glucosides as a vitamin, or vitamins. Further, there is some confusion because Krebs considers the full range of beta-cyanogenetic glucosides to be vitamin B_{17}, while the McNaughton Foundation exclusively refers to amygdalin as B_{17}. At least one research report within California health department circles when this was written attacked the concept that the substance Laetrile is a vitamin. If Krebs's massive research on nitriloside is anywhere near the mark, then plainly nitriloside *is* a vitamin, meeting the usual definition that a vitamin is any of a group of constituents of most foods in their natural state, of which very small quantities are essential for the normal nutrition of animals, and possibly of plants.

A letter of December 18, 1973, to National Health Federation legislative advocate Clinton Miller from the "division of regulatory guidance, office of

compliance, bureau of foods," FDA, bore a succinct message: "We have not officially defined the term vitamin."

Dr. Krebs describes vitamin B_{17} in its pure form as a white, sugary, slightly bitter crystalline substance which, like all other members of the B vitamin complex and like all other water-soluble vitamins, is without toxicity. In fact, he said, when administered to diabetics, the quantities may be very large without any untoward effect whereas a comparable quantity of table sugar could be fatal.

Speaking around the nation, Krebs said the vitamin (Laetrile, nitriloside, amygdalin), in addition to its alleged anticancer properties, has a host of collateral biological or physiological functions including the production of benzoic acid, itself a detoxicant and containing antirheumatic properties. A breakdown product of vitamin B_{17} is thiocyanate, which, among other things, has an action that reduces excessively high blood pressure.

The various metabolic uses of vitamin B_{17} were, of course, key to the case of Dr. John A. Richardson in California, arrested on "cancer quackery" charges for allegedly dispensing Laetrile in the treatment of cancer. The state's health code recognized the use of amygdalin (again, the common and accepted chemical name for Laetrile or vitamin B_{17}) in treating metabolic deficiencies. The state statutes opposed its use solely in cancer treatment. The intriguing legal point remained: If a physician is simply treating the metabolism with vitamin therapy, it is surely legal to use vitamin B_{17} even if the patient happened to have cancer. That the state took a dim view of this approach, which literally sidestepped all efforts at the crackdown against Laetrile, was the probable key motivation behind the doctor's continuing litigation.

As this book was written, there also loomed the possibility, which remained to be demonstrated in fact, that vitamin B_{17} might actually also have antibiotic qualities.

What might turn out to be an almost equally impressive use of vitamin B_{17} is the alleged prevention of the "hemolytic crisis" or severe symptoms of sickle-cell anemia. This possibility, of immediate importance to at least 50,000 black Americans who are suffering from sickle-cell anemia and the two million American Negroes in the U.S. estimated to have the genetic sickle-cell trait, was developing as 1974 began. A single research paper by Robert G. Houston of the Foundation for Mind Research, Pomona, N.Y., and drawing on some forty varying medical and scientific sources, reached a conclusion which warmed the cockles of Ernst Krebs, Jr.'s heart: The rarity of sickle-cell anemia in African Negroes as compared with those in the United States "is associated with a prevalence of thiocyanate-yielding foods in native African diets."[5] That is, cyanate, which the author terms an inhibitor of sickling (a defense Mother Nature may have supplied as a protection against malaria), develops from the oxidation of thiocyanate, which is formed from

5. Robert G. Houston, "Sickle Cell Anemia and Dietary Precursors of Thiocyanate," Foundation for Mind Research, Pomona, N.Y., 1973. (An abstract of this paper appeared in the November 1973 *American Journal of Clinical Nutrition.*)

nitrilosides (the beta-cyanogenetic glucosides) in food plants. Again, vitamin B_{17} at work.

Concluded Houston: "Clinical use of cyanate and thiocyanate has ameliorated sickle-cell anemia at dosage levels derivable from African diets. It is proposed that the disease represents an unrelieved nutritional dependency on thiocyanate and nitriloside in those genetically affected." He referred to clinical trials at Rockefeller University as reported in 1972 by Gillette et al. and a host of related studies.

The underlying theory is this: the natural, vitamin B_{17}-containing foods in the African diet provide the extrinsic factor to the development of sickle-cell anemia among Negroes with the sickling trait. But no such extrinsic defense against the development of sickle-cell anemia among those with the sickling trait exists for American Negroes—who, by and large, are eating the same vitamin B_{17}-deficient processed foods as other Americans are.

A San Francisco physician, Dr. Dennis Myers, began working in 1973 with sickle-cell anemia-afflicted black children, and by April 1974 was able to pinpoint an apparent case of sickle-cell anemia control of an eleven-year-old girl through the simple expedient of having her take oral doses of Laetrile on alternate days. She had been free of the need for hospitalization for almost eighteen months, he said. He added that he suspects a low, but still undetermined level of nitriloside available from natural sources in seeds, kernels, and various foods is the best way to prevent the hemolytic crisis from developing. That same month, Berkeley City Council became the first public body to take an interest in the possible use of vitamin B_{17} in sickle-cell anemia, and ordered a study done on the subject.

Other claimed benefits made for vitamin B_{17} in the diet, and as tabulated by Dr. Stewart Jones,[6] include help in prevention of pernicious anemia, amelioration of hypertension, and amelioration of arthritis symptoms.

Were vitamin B_{17} to be a natural preventative of sickle-cell anemia as well as of cancer—or, if only helpful in both these areas—its two-in-one efficacy would make it the most potent vitamin known to man and its use one of the most astounding developments in modern science.

6. Stewart M. Jones, "The Immoral Banning of Vitamin B_{17}: How It Came About and How It Is Continuing." Palo Alto, California, January 1974.

8

From Manila to Palo Alto: Laetrile's Defenders

In researching all I could about Laetrile, I sought out practitioners who had been in the forefront of the controversy since its beginning, and others who had just joined the battle. I wanted to determine if those who had been impressed by the early Laetrile results were still interested, or if they had given up or believed the Laetrile approach was in error.

It was therefore fascinating to me to note the similarity of views between one of the Laetrile pioneers, Dr. Manuel Navarro of the Philippines, a committed Laetrile therapist since the 1950s and a key developer of the urine test for detection of cancer, and Dr. Stewart M. Jones, Palo Alto, California, who turned from skeptic to convinced laetrilist and outspoken opponent of the medical bureaucracy. For Dr. Jones, there was a personal stake: his mother was suffering from tongue cancer, and he found Laetrile of positive benefit. For Dr. Navarro, Laetrile has been a labor of love since the early years. In the eyes of Dr. Jones, it has been a pitched battle since 1971.

Dr. Navarro, primary Asian advocate of the unitarian or trophoblastic theory of cancer and the use of Laetrile in cancer therapy, has been battling on the side of Laetrile efficacy in word and deed for well over two decades. I met the wiry, soft-spoken, long-time scientist at his office in the vintage University of Santo Tomás in Manila, while on a news-gathering tour of Southeast Asia in August-September 1973.

Although he has worked in Laetrile since the information on it became known worldwide in the 1950s, the professor of medicine and surgery had dealt with only about 800 cases personally at the time of our interview and was still dependent on Mexico for supplies of the substance. But of those 800 cases, he told me, ninety-five percent showed "positive signs of relief, particularly relief of pain" and even during the early days of 100-milligram doses this palliative effect was noticeable. Dr. Navarro has since upped the active dosage to as high as fourteen grams per day in some cases.

A faithful adherent of the unitarian theory, Dr. Navarro developed a refined test for detection of human chorionic gonadotropin (HCG) in cancer patients in 1963 at the University of Santo Tomás during a student competition. He came up with the test by utilizing a similar approach for the detection of pregnancies.

That both cancer patients and pregnant women secrete the HCG hormone, quite in keeping with unitarian theory, has been accepted by some of Laetrile's opponents, even though the "UT" theory overall—as the earlier Beard Anthrone Test (BAT)—has been denounced by state departments of public health. Navarro and his associates utilized the immunological test for cancer detection and, as late as 1971, had detected HCG in the urine of 1,563 cases of proven cancer located from head to foot and belonging to thirty-four different histological types. Included were cases of leukemia.[1]

Navarro argued repeatedly in medical journals that the HCG "immunoassay" usable in detecting pregnancies could also be utilized for the early detection of cancer while it is still amenable to treatment or to protect against postoperative recurrence. "I had been laughed at for using the urine test, but now it is being used in America," Navarro told me with a wink. He referred to the 1969 report of J. E. Dailey and P. M. Marcuse, who noted: "Detection of chorionic gonadotropin may be an aid in the diagnosis of bronchogenic carcinoma [lung cancer].... A positive test for chorionic gonadotropin in the urine is confirmatory evidence of a gonadotropin-producing tumor. The use of more sensitive techniques such as the hemagglutination test for chorionic gonadotropin might lead to the diagnosis of more patients with bronchogenic carcinoma while they are still amenable to treatment."[2]

This was even before Dr. Navarro was aware of the Braunstein study in July 1973, which helped put the frosting on the cake. Using modern radio-immuno-assay techniques for examining serum, Braunstein and his associates reported the presence of the hormone in a substantial number of patients with a variety of tumors.[3]

The California Cancer Advisory Council's attack on the earlier BAT (Beard Anthrone Test) in 1964 had found that the test was "of no value in the diagnosis of cancer." It added: "The Cancer Advisory Council hereby recommends to the State Department of Public Health that all persons, firms, associations and other entities administering the said anthrone test or one substantially similar thereto as a diagnostic agent for cancer, be ordered to cease and desist from such administering, and that appropriate proceedings be taken

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1. Manuel D. Navarro, "Why Are Cancer Patients 'Pregnant'?," *Santo Tomás Journal of Medicine* 26, no. 3 (May-June 1971).

2. J. E. Dailey and P. M. Marcuse, "Gonadotropin Secreting Giant Cell Carcinoma of the Lung," *Cancer*, 24:388-396, August 1969.

3. Braunstein et al., *National Institutes of Health*, July 1973, quoted in *Physician's Handbook of Vitamin B17 Therapy*, The McNaughton Foundation, P.O. Box 17, San Ysidro, California, October 1973.

to give immediate effect to this recommendation."[4]

The laetrilists would argue that it would behoove American science to reexamine the urine test for cancer detection, a method routinely used by Doctors Contreras and Richardson.

The reality that both pregnant women and cancer patients would tend to secrete HCG flows from the unitarian thesis, and as late as 1972 more orthodox journals were coming close to a recognition of the similarity between cancer and the embryological process. For example, in *Science* for October 17, 1972, pathologist D. H. Koobs interestingly concluded an article with these observations: "Perhaps carcinogens, including viruses, uproot the control mechanisms normally associated with the program of conception. Because cancer cell metabolism and growth characteristics are so similar to the process of conception, it appears that the immunologic manipulation which allows the maternal host first to tolerate—then reject—the physiologic 'tumor' is indeed a good model for investigating cancer therapy."[5] Particularly, this layman might add, if the Beard premise—that cancer and trophoblast are the same thing—is true.

Hence, that HCG is secreted in "natural" pregnancy and "unnatural" cancer naturally follows if the unitarian or trophoblastic theory of cancer—that the trophoblast in pregnancy and cancer are the same thing—is correct, or even mostly correct. A company that manufactures pregnancy testing kits "simply cannot understand why a pregnancy test it has devised can be used for detecting cancer," Navarro said in Manila. He remains as outspoken as Krebs in trying to explain the entrenched opposition to Laetrile, let alone the "UT" approach to cancer.

"It's economics," he told me. "The surgeons will lose patients, the radiologists will lose patients, X-ray machine makers will be affected, drug companies manufacturing cancer drugs will be affected. Aspirin itself and other pain killers will be affected." The Laetrile theory and use are just too simple to be easily accepted by medical orthodoxy, he argued, noting that his own battle in the Philippines has been waged against a medical establishment profoundly influenced by the Americans.

A similar case is made by Palo Alto's angry Dr. Stewart M. Jones, who was incensed enough about what he found to be top-heavy arguments against Laetrile without much supportive data that he investigated the matter thoroughly. The product of his investigation, ultimately, was his own booklet, *Nutrition Rudiments in Cancer*, distributed in 1972 by the Committee for Freedom of Choice in Cancer Therapy and the stimulus for heated debate between Dr. Jones and fellow physicians.

Dr. Jones states boldly and bluntly:

> The cancer industry in the U.S.A. has become so large and its beneficiaries

4. *Diagnosis of Cancer with Anthrone Test*, California Department of Public Health, 1964.

5. D. H. Koobs, "Phosphate Mediation of the Crabtree and Pasteur Effects," *Science* (October 17, 1972).

so powerful, that any truly promising prophylaxis and control of cancer is bound to encounter powerful resistance. Many before Laetrile have been squelched by such measures as the ACS' *Ca-A Journal for Clinicians* under the "Unproven Methods of Cancer Management," or by the FDA.

Articles favorable to measures banned by the FDA, AMA and ACS are regularly shunned by scientific journals in the U.S.A. because of the fear of loss of status if such topics are covered. This reticence of scientific journals to publish such politically controversial material leads to widespread ignorance among M.D.'s about Laetrile and other methods.

Scientific rationale and clinical results are not factors influencing the acceptance of a promising prophylaxis and control of cancer except in an inverse way. The more promising such a method appears, the more strenuously do the beneficiaries of the entrenched cancer industry and their agents rationalize, malign, exaggerate and otherwise obfuscate against the facts about the proposed method.

Students of Laetrile and banned vitamins B_{15} and B_{17} are relatively weak, as individuals, in any fight against the entrenched, united economic beneficiaries of the cancer industry. They should leave such a fight to the entrenched, economic beneficiaries of any successful prophylaxis and cure of cancer—such as the mammoth life insurance and medical insurance companies—when they awaken from slumber.

Moreover, wrote Dr. Jones:

> This huge industry provides life-sustaining revenues and desirable standards of living and social position to the following groups of people (a partial list):
>
> Surgeons who do cancer surgery, oncologists and other internists, general practitioners who treat cancer victims, gynecologists, pediatricians treating cancer in children, nurses who treat and care for cancer victims, all research scientists engaging in cancer research, all employees and stockholders of the following: nursing homes, hospitals, radiation equipment manufacturers and servicing organizations, therapeutic X-ray equipment makers, hospital suppliers, medical and surgical suppliers. . . ."[6]

Dr. Jones first became involved in the Laetrile story when he read the attack on Laetrile in "Unproven Methods of Cancer Management" in *Cancer* (October 1971). The Palo Alto physician recalled that he had read enough attacks on Laetrile to reach the assumption that it must truly be dangerous. But when he went looking for documentation to "disprove" what the laetrilists were saying, he could find little. "The more I delved into it, the more incensed I became," he said. He read all that he could, including Howard Beard's massive work, and became convinced of the nutritional aspects of cancer in general and the efficacy of Laetrile in particular.

Unlike Dr. John Richardson from nearby Albany, Dr. Jones did not get into the business of treating cancer patients. He did, however, make arrangements to be able to "lend" Laetrile. "I do not sell or prescribe Laetrile. I lend it, and I only accept repayment in kind," he said, fully aware of California law. "You can lend anybody anything. I also tell people I am not treating their cancer—they are left under their own doctor's care. I do say I treat patients

6. S. M. Jones, *Nutrition Rudiments in Cancer* (Palo Alto, Calif., 1972).

for nutritional needs, and this includes B_{17}. I advise against radiation and chemotherapy."

Since he convinced himself of the efficacy of Laetrile, said Dr. Jones, he had "dealt with" fifty to sixty patients between 1971 and 1973. All of these, he said, exhibited various kinds of relief, particularly in analgesic responses. He became so excited over the nutritional approach to cancer that he circulated his booklet to nearly 400 medical students at Stanford University Medical School and Research Center as well as to every member of the San Mateo County Medical Society. But the early reaction was upsetting. It ranged, he recalled, "from mild interest to complete apathy."

Nonetheless, because of the widespread circulation of his views, Dr. Jones learned that far more people than he had ever supposed were in fact using Laetrile, availing themselves of the "Laetrile underground" in California or making the "Tijuana connection" in Mexico. He invited me to examine his copious files on Laetrile use, including correspondence from physicians. On the surface they tended to confirm Committee for Freedom of Choice in Cancer Therapy chairman Bob Bradford's remark to me, that some 400 physicians around the country were using Laetrile—whether they called it amygdalin, vitamin B_{17}, or nitriloside.

Wrote a Philadelphia M.D.: "Many thanks for the recent literature. I am using amygdalin personally and professionally but have not had sufficient time for complete evaluation."

Wrote a Honolulu nutritionist to a Burlingame, California, physician whose letter attacking Dr. Jones was published in *Cancer News Journal*:

> I have personal experience with Laetrile and nutrition in the treatment of cancer. My own brother was stricken with Hodgkin's disease and given three months to live. That was over three years ago. A tumor in his chest was almost volleyball size and was completely dissolved after he underwent Laetrile treatment in Mexico and was put on a strict diet that included megavitamin therapy. He now golfs twice a week and took his family on a 5,000-mile road trip to celebrate his recovery. His is only one of many, many examples.

Urged by another physician in California to turn over documents he had on Laetrile efficacy in cancer treatment—a request frequently pressed by the State Department of Public Health—Dr. Jones wrote in March 1973:

> . . . Nothing would delight me more than to review records of my cancer patients who have been under Laetrile therapy, with you or anyone else who may be interested.
>
> However, if I or you treated anyone who had cancer with Laetrile, the United States Federal Drug Administration [*sic*] and the California Drug Administration [*sic*] would have long ago confiscated our records and arrested us. The fate of Doctor Richardson of Albany is certainly testimony to this fact. . . .
>
> There are *many* people in the Bay Area that showed improvement or arrest of their documented malignancies after Laetrile therapy. Some doctors in the California medical hierarchy are presently taking Laetrile for their own cancers. Most of the records of local patients who have or are receiving Lae-

trile therapy are with Doctor Contreras of Mexico or Doctor Hans Nieper of Germany.

Any doctor treating them openly here is breaking the law. You certainly are aware of this, I am sure.

Dr. Jones perceives his role as tilting at the windmill of entrenched medical orthodoxy and its overlap with economics any way he can. (Hence the preface to his booklet: "Dedicated to economics, which makes politics understandable and bedfellows less strange.") He took up the cudgels for eighty-six-year-old nutritionist Emory Thurston, arrested and released on $2,000 bail for "practicing medicine without a license" in supplying Laetrile, and for Dr. Harvey E. Howard, who was arrested after selling Laetrile to an undercover agent. In the prior case, a supply of Dr. Jones's books was confiscated when Thurston, executive secretary of the Institute of Nutritional Research in Hollywood, was arrested. In the latter case, Jones wrote to the Chino Institution for Men in behalf of the incarcerated Dr. Howard:

I have been very much impressed with Dr. Howard's knowledge of nutrition and his dedication to helping anyone who needed help, especially persons suffering from cancer, who are the innocent victims of our vicious and discriminatory state law against the use of Laetrile for the treatment of cancer.

I have personally seen dozens of cases of cancer, many of them poisoned or disfigured by the California state-allowed treatments of surgery, radiation or chemotherapy, that improved after taking Laetrile. Many of these patients, considered terminal by orthodox M.D.'s, had dramatic improvement even from the first dose of Laetrile. . . .

Personally, I feel that the members of the Department of Public Health for the State of California, and the California FDA, Fraud Department, should be the ones jailed because of their inhuman, discriminatory laws against the victims of cancer who are forced to accept the state approved lethal treatments. Only California and Pennsylvania have these disgraceful laws which result in the arrest of someone like Dr. Howard who was entrapped by the unscrupulous agent . . . while trying to help what he thought was a bona fide patient. At night before I go to sleep I often think of those miserable people who are bringing so much suffering to the cancer victims in order to preserve the huge cancer industry.

Dr. Jones, by no means a John Bircher, is convinced of the conspiratorial nature of what he calls the "industrial-medical-government triumvirate" and says the individuals who compose it "are behaving just as rationally as most people everywhere have always behaved when choosing between secure maintenance of a comfortable economic status quo and severe economic sacrifice to promote the general welfare." (And, hence, the postscript to his booklet: "It is far more profitable to look for a cancer cure than to find one.")

There is a way, he suggests, to oppose what he calls "Laetrile suppression." As he writes in his booklet: "The effective way to oppose Laetrile suppression is to enlist and band together those interests which would economically benefit most by worldwide Laetrile prophylaxis of cancer. A partial list would include: life insurance companies, medical insurance companies,

tobacco companies, cyclamate manufacturers, all manufacturers of carcinogenic substances, beef and poultry growers, makers of DES. . ."

Such a union, he believes, would be an effective economic coalition against the coalition-by-convenience-or-design of medical orthodoxy, federal regulatory agencies, and the pharmaceutical industry.

9

An Insider's Battle: Dean Burk at Work

"Doctors have gone the other route now—they're no longer opposed to Laetrile. They've seen their patients die like flies with traditional treatment and they've decided to give themselves and their families a better chance."

Speaking was Dean Burk, for years the lone, single voice within the federal government persistently arguing for a fair trial for Laetrile. This one-man movement was speaking to the *Anaheim Register,* January 22, 1973, on the fact that he knew that amygdalin—Laetrile's chemical or generic name—was in common use by doctors and their loved ones in cancer treatment despite opposition to Laetrile by the Food and Drug Administration, the American Medical Association, and the American Cancer Society.

He was particularly credentialed to do so. As head of the cytochemistry section of the National Cancer Institute (NCI) and concerned with cancer research for forty-five years, the California-born gadfly of the Laetrile movement had been actively involved in Laetrile probes since 1968. He had become an outspoken champion not of the total efficacy of Laetrile, let alone of the unitarian thesis (which he frankly pooh-poohed, at least in part), but of the need for fair testing of the substance.

The salty, cigar-chomping, explicit phrase-making biochemist usually took on, all alone, the National Cancer Institute, the FDA, and the medical bureaucracy itself, testifying before Congress on Laetrile, writing legislators, rebutting the official line whenever and wherever possible, speaking out publicly and risking condemnation from the ranks of government.

At NCI headquarters in Bethesda, Maryland, his colleagues took a dimmer view of his activities. As an NCI spokesman told the *Los Angeles Times*, July 16, 1973: "The NCI has consistently held the position that Dr. Burk has the right to exercise his freedom of speech if he makes it abundantly clear that he does so as a private citizen and not as a representative of the institute.

"However, as a result of inappropriate advocacy of Laetrile, Dr. Burk has been officially reprimanded for violations of the Department of Health, Education and Welfare's standards of official conduct."

To which Burk responded: "I love the National Cancer Institute and even helped to create it, but I don't like to see any public servant telling lies to the public. They did get some positive results (on Laetrile tests on mice), much to their surprise and disappointment."

By 1974, Burk, who never held the position that Laetrile was the single answer to cancer, was almost as enamored of the chemical hydrazine sulfate—making sudden, startling progress in tests on cancer control—as he had been of Laetrile.

The veteran biochemist whose multidegreed, merit-winning background takes up thirty lines in *Who's Who in the World* began his interest in Laetrile by conducting tests on animals at the suggestion of the McNaughton Foundation's founder-president. These early results showed Burk there was "something to" Laetrile.

A thorough scientist who often told me he was keeping his mind open to every possibility about cancer (and everything else), Burk actually had associated himself more with Otto Warburg's thesis that the prime cause of cancer is the replacement of oxygen in normal body cells by a fermentation of sugar. Burk edited the English edition of Warburg's "The Prime Cause and Prevention of Cancer" lecture before Nobel laureates in 1966. Warburg's attack on the more "orthodox" concept that cancer is essentially a virus-caused disease remains among the more lucid putdowns of that concept. As translated by Dr. Burk:

> To conclude the discussion on the prime cause of cancer, the virus theory of cancer may be mentioned. It is the most cherished topic of the philosophers of cancer. If it were true, it would be possible to prevent and cure cancer by the methods of virology; and all carcinogens could be eaten or smoked freely without any danger, if only contact with the cancer virus would be avoided.

Two realities most disturbed the veteran biochemist during his battle with the powers that be: First, he knew (and said so in various public lectures entitled "A Very Grim Picture") that conventional, orthodox cancer drugs are toxic and that their success rate on cancer is miserably low. And second, his was the primary voice speaking out consistently to demonstrate that not only did Laetrile therapy obviously provide "some" relief for cancer patients, but it was nontoxic—at least in any meaningful sense. These two realities sharpened his desire to do battle.

He was not alone, of course, in questioning the viral theory of cancer, the notion that somehow cancer is an alien, outside disease, and that it must therefore be treated with radical means: chemotherapy, radiation, and surgery. If the premise that cancer is an "outside"-caused disease is valid, then the methods of cut it out, burn it out, and cut it off hold up. If, instead, cancer is an intrinsic condition—a metabolic malfunction—then the trinity of chemotherapy, radiation, and surgery constitute the treatment of symptoms, not the treatment, or even the finding, of causes.

Medical history is replete with examples of such well-intentioned if ill-founded practice, and the analogy of syphilis comes to mind. It took medicine hundreds of years to learn that syphilis is a general, pervasive disease of which skin ulceration is only a symptom. Even so, the treatment of symptoms did, from time to time, cause palliation.

Dean Burk, whose doctorate is a Ph.D., not an M.D., was continually distressed to note the toxicity of the "modern" approach to cancer: chemotherapy. Chemotherapy is the treatment of cancer tissues and/or disease-causing micro-organisms by chemicals that have a specific, poisonous effect on the tissues or micro-organisms. Reduced to simplest terms in cancer therapy, it is the treatment of neoplasms with poisons. All of the chemotherapeutic agents in cancer therapy are poisonous to a greater or lesser degree, and some of them are extremely dangerous. Even in those authentic cases where they retard or arrest cancer tumors, their effect on the body ranges from mildly to highly poisonous. Too, only a few decades ago chemotherapy was thought to be practically as unwarranted as orthodox medicine believes the Laetrile approach is today.

The mildest effects of chemotherapy parallel something on the order of narcotic withdrawal symptoms—cramps, lessened appetite, growing weakness, nausea, and diarrhea. In advanced symptoms, hair frequently falls out and other unpleasant side effects have been noted. One study in the *New York Journal of Medicine* for March 1, 1971, admits a death rate of ten percent—that is, from chemotherapy, not from cancer.[1]

The defense of chemotherapy among oncologists seems almost to be a last-ditch, clutch-at-any-straw affair. In *The Wayward Cell* (University of California Press, 1972), Dr. Victor Richards describes the failure of chemotherapy and, interestingly enough, adds: "Nevertheless, chemotherapy serves an extremely valuable role in keeping patients oriented toward proper medical therapy, and prevents the feeling of being abandoned by the physician in patients with late and hopeless cancers. Judicious employment and screening of potentially useful drugs may also prevent the spread of cancer quackery." Never mind, one might add, the high cost of these toxic drugs in legitimate cancer therapy.

Whenever possible, Burk brought up statements by officialdom and orthodoxy pointing to the low-level five-year survival rates for metastasized (spread) cancer, indicating that in general cancer sufferers can expect only a 7.5 percent five-year survival rate.[2]

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1. Cited in Alan Stang, "Laetrile: Freedom of Choice in Cancer Therapy?" *American Opinion*, January 1974.

2. Dr. Burk's letter to Rep. Louis Frey, Jr., circulated both privately and published in *Cancer Control Journal*, May-June 1973, quoted NCI Director Dr. Frank Rauscher, Jr.: "Of the 100 cancers that afflict man, about fifteen percent of these can be treated extremely well, to the point of at least fifty percent five-year survivals." Burk extrapolated: 15% x 50% = 7.5%. I approached both NCI and American Cancer Society (ACS) spokesmen at the March 1974 ACS science writers' seminar on the above subject. Their consensus was that survival rates are indeed low—too low—but as of 1974 they thought it "dangerous" to make an across-the-board determination of 7.5 percent.

Whether or not "objective benefit" from orthodox cancer approaches is that low or not, by 1974—at least according to National Cancer Institute and California Department of Health spokesmen with whom I spoke—the estimated survival rate seemed better but hardly optimistic. The California department informed me that "the relative five-year survival rate for all cancers (excluding basal and squamous skin cancer and in-situ cancers) is 40 percent." The relative five-year survival rate for patients with early (localized) disease is 68 percent, they added.

In Summer 1973, Burk quoted ranking researchers to the effect that "85 percent of cancers do not respond to any drugs."[3] Some tumor systems seem virtually insusceptible of treatment by standard methods; others are susceptible if caught early enough.

Burk did not argue that Laetrile-using physicians were reporting in excess of a 15 percent "objective benefit" in direct cancer therapy (understanding, again, that the great majority of patients whom they see are terminal ones), but such therapists do add two major elements: no harmful side effects and much higher percentages of pain relief than the 5 to 15 percent "objective benefit" in patients.

Burk was fond of quoting from the Sixth National Cancer Conference Proceedings, jointly sponsored by the American Cancer Society and the National Cancer Institute in 1968. Among the testimony from the conference (and published by Lippincott in 1970) were these statements:

Robert D. Sullivan, M.D., Department of Cancer Research, Lahey Clinic Foundation, Boston (p. 543): "There has been an enormous undertaking of cancer research to develop anticancer drugs for use in the management of neoplastic diseases in man. However, progress has been slow, and no chemical agents capable of inducing a general curative effect on disseminated forms of cancer have yet been developed."

James F. Holland, M.D., Roswell Park Memorial Institute, New York State Department of Health, Buffalo, N.Y. (p. 609): "Human cancers are refractory in large part to cure by the chemotherapeutic approaches which have been tried. . . ."

William Powers, M.D., director, Division of Radiation Therapy, Washington University School of Medicine, St. Louis (p. 33): "Although preoperative and postoperative radiation therapy have been used extensively and for decades, it is still not possible to prove an unequivocal clinical benefit from this combined treatment. . . . Even if the rate of cure does improve with a combination of radiation and therapy, it is necessary to establish the *cost* in increased morbidity which may occur in patients with or without favorable response to the additional therapy."

Philip Rubin, M.D., chief, Division of Radiotherapy, University of Rochester Medical School, Strong Memorial Hospital, Rochester, N.Y. (p. 855): "With thousands of lung cancer patients treated by irradiation, the value of radiation therapy should be clearly established or disestablished. The in-

3. *Ibid.*

dictment of radiotherapy in the treatment of this disease by Kraut ('The Question of Irradiation Therapy in Lung Cancer,' *JAMA* 195 [1966]: 177-81) is a carefully researched document that has to be considered. The clinical evidence and statistical data in numerous reviews are cited to illustrate that no increase in survival has been achieved by the addition of irradiation."

Vera Peters, M.D., Princess Margaret Hospital, Toronto, Ont. (p. 163): "Shimkin ('End Results in Cancer of the Breast,' *Cancer* 20 [1967]: 1039-43) has shown recently that in carcinoma of the breast, the mortality rate still parallels the incidence rate, thus proving that there has been no true improvement in the successful treatment of the disease over the past thirty years, even though there has been technical improvement in both surgery and radiotherapy during that time."

Robert L. Egan, M.D., professor of radiology and chief, Mammography Section, Emory University School of Medicine, Atlanta, Ga.; and R. Waldo Powell, M.D., associate professor of surgery, Department of Surgery (p. 153): "The thirty-year monotonous plateau of the death rate for breast cancer has persisted despite physicians' awareness of breast cancer, refinements of methods of inspecting and palpitating the breast, educating women in self-examination, improvements in radiotherapy that include supervoltage, use of more extensive surgical procedures, and the use of chemotherapy and hormones."

I. E. Gillespie, M.D.; H. T. Debas, M.D.; and F. Kennedy, University Department of Surgery, Western Infirmary, Glasgow, Scotland (p. 421): "Since there is yet no sign that either radiotherapy or chemotherapy can offer real therapeutic benefit to patients with gastric cancer, the main hope at present for either cure, or useful palliation, rests with surgical treatment. The many varied surgical approaches do not seem to have made a great difference to the overall outcome in large series of patients, and it seems unlikely that much improvement can be expected from further developments of surgical technique."

Saul A. Rosenberg, M.D., associate professor of medicine and radiology, Stanford University School of Medicine, Palo Alto, Calif. (p. 83): "Thus, worthwhile palliation is achieved in many patients; however, there still will be the inevitable relapse of the malignant lymphoma, and, either because of drug resistance or drug intolerance, the disease will recur, requiring modifications of the chemotherapy program and eventually failure to control the disease process. With very few exceptions, cure is not achieved despite the dramatic initial benefit which is seen in so many patients."

John D. Trelford, M.D., F.R.C.S., Department of Obstetrics and Gynecology, Ohio State University Hospital (p. 379): "At the present time chemotherapy of gynecological tumors does not appear to have increased life expectancy except in sporadic cases. . . . There appears to be no satisfactory method of determining to which drug a tumor will be sensitive. The only basis of selecting a drug is by past experience. The problem of blind chemotherapy means not only a loss of the effect of the drugs, but also a lowering of the patient's resistance to the cancer cells owing to the toxicity of these agents. . . . At the present time

there is no satisfactory method of stimulating or mobilizing the host's immunological defenses to aid in controlling or eradicating the patient's malignancy."

In his lengthy report on Laetrile to Congressman Louis Frey, Jr., Dr. Burk also pointed to the May 18, 1972, lecture by Dr. Charles Moertal of the Mayo Clinic at the heavily attended chemotherapy conference held at the National Institute of Health. He quotes Moertal:

> Perhaps some small and hesitant progress has been made, but it is evident that in this year of 1972 there is no remarkably effective specific therapy for any types of gastrointestinal carcinoma that cannot be surgically extirpated. There are none that can be accorded the stature of treatment of preference.
>
> Our most effective regimens are fraught with risks and side-effects and practical problems, and after this price is paid by all the patients we have treated, only a small fraction are rewarded with a transient period of usually incomplete tumor regressions. . . .
>
> Our accepted and traditional curative efforts therefore yield a failure rate of 85 percent. These patients with advanced gastrointestinal cancer present us with one of the most frequent major disease problems encountered in medical practice today. . . . The patient with gastrointestinal cancer is still getting the same old 5-Fu he got 14 years ago.[4]

In the same letter to Rep. Louis Frey, Jr. on May 30, 1972, Burk noted: "That the various administrative agencies claim Laetrile is worthless may be dismissed . . . as unscientifically based, together with the fact that few or none of such claimants has ever worked personally with Laetrile and patients, nor have they seriously if at all ever visited hospitals and clinics where Laetrile is used, and their alleged medical basis goes back to the 1953 report of the California Cancer Commission which described no patient ever receiving a *total* dosage of Laetrile as great as is now the current standard *daily* dosage (3 grams per day or more)."

While the expensive, toxic cancer drugs were securing minimal benefits for a small number of cancer patients, medical orthodoxy and governmental orthodoxy were mobilized against Laetrile, a state of affairs that exasperated Burk. In his letter to Frey, Burk wrote:

> Although . . . Laetrile utilization in this country is proceeding . . . in spite of FDA prohibitions, it is even more so *because* of unwarranted FDA procedures, and lack of FDA scientific and medical justification for its stand, extending to probable unconstitutionality, concerning which many thousands of cancer-afflicted persons and their relatives and physicians are rapidly becoming aware.
>
> . . . I have hundreds of letters sent to me enclosing FDA information sheets and pronouncements, in which the senders of these letters point out the extensive falsification, duplicity, deviousness, red herrings and literal lies . . . promulgated by the FDA with respect to Laetrile, as well as similarly on the part of a limited number of certain high officials (though scarcely ever rank-and-file members) of the American Medical Association, the American

4. Letter, Dean Burk to Rep. Louis Frey, Jr., May 30, 1972, reproduced in *Cancer Control Journal* (May-June 1973).

Cancer Society, the U.S. Department of Health, Education and Welfare, and state agencies. . . .

It is becoming evident that the current generation of cancer sufferers is coming to regard the intransigence and palpable lies of the FDA and the above-indicated related organizations with a marked measure of contempt on the basis of prima facie evidence provided by these organizations themselves as to their integrity and credibility and that something of a Boston Tea Party mode of action is being undertaken by an increasing number of cancer sufferers in this country, who intend to be hoodwinked no longer; in short, an active backlash is developing even at the grass-roots level. . . .

Part of the "FDA procedures" Burk was so vehement about in his letter to Congressman Frey concerned the apparent sidetracking within the bureaucracy of information and reports for the FDA compiled by McNaughton. A special House committee looked into these and other matters in 1971 to some extent—Burk providing testimony and 400 pages of documentation—but all to no avail.

What spurred a fresh Burk outburst was the letter to Rep. Robert A. Roe from the FDA legislative services division concerning the "evaluation of Laetrile as an anticancer agent," and written as part of the correspondence begun by one of Roe's constituents. It was because the FDA letter mentioned that "*no* evidence of antitumor activity has been found in *any* of the tests" that Burk saw fit to bring to public view the results of animal testing conducted by the NCI in the spring of 1973, and with whose conclusions he disagreed. Burk charged that the NCI "coverup" of positive test results on mice amounted to another Washington scandal of "Watergate" dimensions. Burk went over the series of tests and elicited this finding:

It is quite clear that at the particular dosage of 12.5 mg Laetrile (amygdalin MF) per kilogram of mouse, a statistically highly significant activity of Laetrile against Lewis mouse lung cancer was indeed observed in these NCI-directed studies. . . .

Furthermore, the NCI-observed ILS (increased life span) values of 41, 51, and 30 percent (average 41 percent) with the Lewis lung cancer in 30 mice (three groups of 10 each) given 12.5 mg Laetrile/kg of mouse daily on days 7-15 after tumor inoculation, are not only above the conventionally accepted minimum significance value of 25 percent ILS for mouse cancers in general, but other data on file in the NCI indicate that very few of the common anticancer chemotherapeutic agents show any significant anticancer activity at all against Lewis lung cancer. . . .

Even a schoolboy, fishing in a lake for the first time, and drawing out a fish on the first cast, but none on the second cast, would scarcely conclude therefrom that there were no fish (or no more fish) in the lake. He would almost certainly make more casts. And even if he caught no more fish, he would almost certainly move to some other part of the lake, or change his bait, etc. None of this equivalent procedure with respect to Laetrile efficiency with Lewis lung cancer appears to have been undertaken by the NCI. . . .

You may wonder, Congressman Roe, why anyone should go to such pains and mendacity to avoid conceding what happened in the NCI-directed experiment. Such an admission and concession is crucially central.

Once any of the FDA-NCI-AMA-ACS hierarchy so much as concedes that

Laetrile antitumor efficacy was indeed even once observed in NCI experimentation, a permanent crack in the bureaucratic armor has taken place that can widen indefinitely by further appropriate experimentation.

For this reason, I rather doubt that experimentation of the type indicated by me in the foregoing paragraph will be continued or initiated. On the contrary efforts probably will be made, as they already have, to "explain away" the already-observed positive efficacy by vague and unscientific modalities intended to mislead, along early Watergate lines of corruption, including eventually futile arrogance. . . .

What has been said in . . . this letter re FDA corruption has, over the years, in my experience, been similarly true of letters and information sent out from the office of the director of the NCI with respect to Laetrile. . . .

In view of the trend of the Watergate events on widespread fronts, it is my considered opinion that the director of the NCI and the commissioner of the FDA would do well to suggest to their aids that they henceforth cease and desist in their output of obfuscations, deceptions, deviousness, red herrings, or actual lies regarding Laetrile (amygdalin); and indeed even send out letters of correction to all parties already or recently written to, and notably to members of Congress. . . .[5]

On July 10, 1973, or a week following Burk's letter to Congressman Roe, the NCI associate director for drug research and development announced in a letter to Ralph Glaser, president, Citizens National Committee for Better Health, that "in the case of amygdalin MF there has been a considerable amount of publicity regarding the tests that have been carried out . . . in view of that fact, we have decided to proceed with some additional studies." Shortly thereafter came Burk's announcement in Los Angeles that the Memorial Sloan-Kettering Cancer Center had also undertaken independent studies of the substance.

At the end of 1973, Dr. Burk had become verbally enthusiastic about yet another unorthodox approach to cancer, hydrazine sulfate, a chemical both common and inexpensive and whose use in cancer paralleled the Warburg theory with which the biochemist had earlier associated himself. Indeed, he told me early in 1974 that he believed the chemical might be one of cancer's best battlers, along with Laetrile. Unlike vitamin B_{17}, hydrazine sulfate, whose experimentation was fledgling but swiftly growing, was not touted as a natural preventative of the disease. "In August [1973] twenty to thirty people were taking hydrazine sulfate. By October-November it was 200 to 300. Now it's several thousand," he said.

Clinical trials were planned for the Memorial Sloan-Kettering Cancer Center, and other tests were under way elsewhere.[6] Early results were inconclusive and animal work is continuing. More than one observer exulted that in Laetrile and hydrazine sulfate might lie the ultimate answer to the prevention and control of the dread disease. Burk was not all that optimistic: "It's quite possible that hydrazine sulfate or a drug like it will alter the course of cancer, much as insulin alters diabetes, so a person might live an essentially normal life with

5. Letter, Dean Burk to Hon. Robert A. Roe, July 3, 1973.

6. "Pulling Cancer's Energy Plug," *Medical World News*, October 19, 1973.

the disease . . . instead of lying in a hospital bed waiting for the end," he told the *National Enquirer*.

Dr. Joseph Gold, of the Syracuse Cancer Research Institute in New York State, originator of the hydrazine theory and the early therapies based on it, had been drawn into the study of hydrazine—used as rocket fuel both in Nazi Germany and later in the United States—by the work on cancer-cell metabolism done by Otto Warburg at Berlin's Max Planck Institute. The latter had demonstrated that glycolysis is the major source of energy in cancer cells. It is the action of the cancer tumor in recycling its wastes and converting normal body mass into tumor substrate that causes an enormous energy drain on normal cells. When the body can no longer compensate for the enormous drain of energy caused by the tumor action, weight loss and debilitation quickly occur.

The answer to interrupting this degenerative metabolic process, he decided, was to inhibit gluconeogenesis—the synthesizing of glucose in the liver and kidney cortex. This can be done by blocking a "pivotal" enzymatic reaction in the gluconeogenesis process. Several chemicals will accomplish the blockage but hydrazine sulfate does it the best, he claims.

Dr. Gold's institute reported on September 26, 1973, that the substance had been used in limited numbers of human patients with advanced disease. "Favorable responses in a wide array of different kinds of cancers have been reported with this drug in many of these patients, the principal benefits being prompt cessation of weight loss and regaining of weight, restoration of strength and vigor, marked diminution of pain, restoration of well-being, and cessation of symptoms of the disease," the institute stated. "There have been no reports of serious side effects of sickness, unlike the drugs now used to treat cancer. Hydrazine sulfate was demonstrated by Dr. Gold to be a powerful tumor inhibitor in previously published animal studies," it added. Dr. Gold recited several spectacular cases of virtual restoration to normal-life activities on the part of terminal patients who took hydrazine capsules.

Dr. Burk told me it was still too early to make sweeping claims about the substance, but that so far it had been shown to be nontoxic, a factor recommending it, along with Laetrile, in cancer treatment. He gave every indication that if good results in hydrazine sulfate continue to show up, he will champion that cause as vigorously as he championed Laetrile.

Dr. Burk faced mandatory retirement in 1974 at age 70. "That doesn't mean I'm going to sit back and stay silent," the peppery biochemist said.

Perhaps his answer to a *Los Angeles Times* question on how he has stood up against unyielding bureaucracy so long in his one-man inside battle for the fair testing of Laetrile best sums up his philosophy: "If you will tell the utter, absolute truth, it is remarkable how most of your problems are solved. It simplifies life tremendously. If you start telling half the truth or three-quarters of the truth, they'll get you."

10

Andrew McNaughton: Pioneer of the Human Spirit

"The McNaughton Foundation sponsors deserving research which promises breakthroughs in important new areas where sufficient professional acceptance does not yet exist to gain the support of the usual foundations or agencies. . . . Increasing government involvement in science and education (up to two-thirds of all financing of research and development in the United States since World War II) has resulted in loss of scientific independence and an increasing vulnerability to edicts, guidelines, regulations, and structures stifling independent initiative in solving problems. . . . Uncommitted to extensive buildings and staff, the McNaughton Foundation maintains itself free to sponsor the very best scientist for the specific job to be done in his own research institution wherever it may be in the world. . . . The attention of the McNaughton Foundation is focused upon transforming into reality new solutions to the problems of mankind, not on commercial developments per se or ivory tower research or educational goals. . . ."

So states the "purpose and operation" of the McNaughton Foundation, the sponsor of Laetrile research and development around the world. Established in 1956 as a nonprofit research foundation, the organization has been intimately involved with the Laetrile story since the first flurry of interest in the compound in Canada.

Catching up with the globetrotting Andrew R. L. McNaughton, the foundation's founder-president, is no mean task, since he may be found wherever the current Laetrile action in problems of research and development may happen to be—Mexico, Monte Carlo, Spain, or West Germany, where there are Laetrile-producing factories, or at the Krebs family mansion in San Francisco. There is also a Laetrile-producing facility in Yugoslavia, but McNaughton has no connection with the latter.

A man who prefers to avoid the limelight, the English-born world traveler who spent much of his life in Canada is nonetheless as key to Laetrile as are

the pioneers, developers, and other defenders of it. I usually caught him on the run—just coming from or going to some place. He once gave me a detailed tour of the Tijuana Laetrile-producing plant to watch the extraction process of the substance from raw apricot pit to finished product, and, in other times and places, provided background information on himself and the international progress of Laetrile research, insisting throughout that he personally had "absolutely no financial interest" in it.

A self-sustaining business and engineering consultant, the graying but vigorous son of the commander of the Canadian Armed Forces in World War II who was also a former president of the United Nations Security Council, McNaughton said that his foundation's major remaining preoccupations with Laetrile are in finding ways to make the apricot-pit extract more cheaply and in exploring other cyanide-bearing compounds that can be made synthetically and at low cost.

I had to bear this in mind while hearing criticisms of Laetrile production and distribution as some kind of illicit big business with a profit-motivated Laetrile black market functioning nationwide. Of course, the at times cloak-and-daggerish importation of Laetrile into the United States from Mexico—the common route—conjured up just such an image.

That some doctors who eventually came into possession of Laetrile might charge whatever they wished for the substance was true. And by late 1973 and early 1974 internal disputes over the amounts of Laetrile being brought into the United States, by whom, and sold for how much had broken out as an ever-increasing number of people sought access to the substance banned by the Food and Drug Administration from interstate shipment and sale in the United States. These matters were ultimately out of the province both of the McNaughton Foundation and of the personalities most associated with its development and research, but McNaughton sought to establish maximum wholesale and retail prices on both the freeze-dried injectable product and the pills so that stateside users would have an idea of what actual costs of it were in Mexico.

I also had to bear the McNaughton nonprofit interest in mind while being made aware of some attempts to make inferential connections between Andrew McNaughton and the Mafia.

The foundation's sole financial interest when this was written was the patent it held on the freeze-drying (lyophilization) process and on pending patents concerning related processing systems. In the meantime, said McNaughton, the foundation "has set up a nonprofit trust to which all our interests will be assigned." The trust was planned with a five-member directorate including Dr. Ernst Krebs, Jr., who held the original Laetrile patents. "So no financial revenue comes to the McNaughton Foundation—or Andrew McNaughton personally—at all," he added.

By freeze-drying Laetrile, more of the product can be delivered in less space since it is put up in concentrated form. Federal agencies referred to the substance when it was provided for U.S. animal tests as amygdalin-MF (McNaughton Foundation). Patent control over production, said McNaughton, "is

so that we can exercise quality control about the product and the claims made about it."

When this was written, and with the ban on Laetrile still in effect in the U.S., the source of it was foreign laboratories, most noticeably the Tijuana one. "These factories won't supply the American market after Laetrile becomes 'legal' in the U.S.," McNaughton told me. "We give free courses on how to manufacture the stuff to anyone who will listen. We have no secrets. The factories all use apricot kernels but some also are experimenting with bitter almonds, peaches, prunes, cherries, Johnson grass, and sorghum. Four different organizations are researching the production of synthetic materials."

While the specific product remained banned for interstate shipment and sale as a cancer fighter, the chemical amygdalin, a long-time-listed substance in the respected Merck Index, was by no means illegal, though never touted for use in cancer. Again, the term "Laetrile" was commonly used to refer both to the injectable form of amygdalin and to the general class of substances in nature referred to as beta-cyanogenetic glucosides. These substances, in turn, were given the denomination "nitriloside" by Krebs. McNaughton distinguished vitamin B_{17} by tabbing it the "oral form" of amygdalin.

Biochemist Dean Burk was fond of pointing out that while Laetrile as a manufactured product referred to the extracted, crystallized, purified form of amygdalin, and while amygdalin and prunasin are the two major beta-cyanogenetic glucosides of medical interest, the products are essentially the same thing when broken down in water.

While price differentials vary from doctor to doctor and situation to situation in the illicit American market, "we say the price ought to be $6.25 per three-gram dose [of Laetrile]," McNaughton said of the ever-recurring controversies arising over the cost of supplying the substance. The cost included seventy-five cents for "handling"—but inasmuch as this actually could mean smuggling when it entered California, the price of Laetrile tended to zoom, particularly in the fall of 1973 when increased demands for it were also accompanied by a seeming pattern of heightened legal harassment. The regular price at the CytoPharma laboratory in Tijuana was $4.50 per three-gram vial. An additional seventy-five cents for handling, and a $1.00 profit was McNaughton's presumed normal price per three-gram vial. His concern that the price be kept as low as possible collided with the demands of the black market at the same time. Rumored prices were put as high as $24 (with one report of $50) per vial.

The cost of Laetrile and its therapy and the Contreras treatment became a tool honed by the anti-Laetrile forces, as part of the "now-they're-soaking-the-desperate" variety of propaganda. In the November 1973 *Today's Health*, a severe attack on Laetrile and on Doctors Krebs and Contreras was leveled. The article suggested that Laetrile was big business bilking desperate terminal cancer patients.[1] The claim was made that the true price of manufacture was no more than two cents per pill.

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1. Terri Schultz with Bard Lindeman, "The Victimizing of Desperate Cancer Patients," *Today's Health*, November 1973.

Dr. Stewart M. Jones, the Palo Alto medic who had become an outspoken proponent of Laetrile when he delved into all the information he could find on the subject after repeated attacks on it by state and federal authorities, did his own price checking, and so informed *Today's Health.* The actual costs at the time—rather than the 2 cents per pill as suggested by the magazine article—were, as sold by CytoPharma (the only official outlet selling the product), 8 cents per 100-milligram tablet, 20 cents per 250-milligram tablet, 40 cents per 500-milligram tablet, and $4.50 per three-gram vial for injection.

In something of a permanent rage against the anti-Laetrile forces since 1971, Dr. Jones also chided the authors of the article in a letter he made public:

> You give prices in Contreras' clinic: a. $15 for three daily injections. b. $200 for room and board. You don't say for how long—sounds like one week. I visited the Del Mar Hospital, December 1972, and found all patients—mostly U.S. citizens—dumbfounded by how cheap and how much more effective their Mexican treatment had been compared to their prior treatment in U.S. hospitals. As you know, one week's treatment for cancer in *any* U.S. hospital is *more than* $215 per day. And the results are worse! Referring back to . . . where you say Laetrile costs 2 cents per tablet, I say radiotherapy costs 2 cents per treatment, as the raw material, electricity, costs about 10 cents per kilowatt.

Actually, the hospital costs when I visited the facility in 1972 were between $17 and $24 per day for single to double occupancy including board, a figure unheard of in the United States.

The *Rochester* (Minn.) *Post-Bulletin*, whose January 1974 series on Laetrile was one of the few in-depth reporting jobs on the controversial treatment, found the Tijuana costs quite reasonable: A $10 first-office call, subsequent $7 office visits, $3 clinical service fee per visit, and $30 daily charge for private hospital rooms, $20 for semiprivate.

By late 1973 McNaughton sought to establish a price lid for Laetrile. He reported in January 1974 that he had worked out an agreement with Mexican authorities as to what maximal prices ought to be, a binding accord in Mexico inasmuch as the Mexican government sets drug prices. The effort was to alert U.S. consumers as to the true costs of the substance. The agreed prices were $5.25 maximum wholesale price per three-gram vial available at the CytoPharma de Mexico laboratory, and maximum retail price, $9.00 per vial; and maximum wholesale price per 500-milligram tablet, 50 cents, with maximum retail price set at $1.00.

McNaughton's stated background is impressive enough: Son of the late General A. G. L. McNaughton, commander of the Canadian Armed Forces in World War II and a former president of the United Nations Security Council and of the National Research Council of Canada, the younger Andrew grew up in a domestic setting of research, great men, and great ideas. His education included a four-year classical course under the Jesuits at Loyola College, Montreal; electrical engineering at the Royal Military College, Kingston, On-

tario; geology and mining at McGill University, Montreal; and business administration at Alexander Hamilton Institute. He served as a pilot in the Royal Canadian Air Force from 1939 to 1946, winning the Air Force Cross for his performance as a test pilot. Indeed, he was the RCAF's chief test pilot and commanded the air arm's Experimental Test and Development Centre. He has been active in scientific and consultative groups in various fields, and his memberships span the spectrum from the New York Academy of Sciences to patronship of the Point Reyes (California) Bird Observatory and the Royal Society of Medicine.

Unofficially, though, McNaughton has other credentials, which he does not hesitate to discuss: gunrunner to Cuba and Israel (and made "honorary citizen of Cuba" along with Che Guevara) and a man whose involvement with Laetrile led to ostensibly Mafia-connected gifts to the McNaughton Foundation. His professed role as a July 26 Movement agent in the late 1950s—not out of love for Castro or any connection with communism but out of idealism and belief in democracy—and the Mafia-tie allegations were sometimes used against him as the Laetrile story unfolded. He was, and is, an adventurer—both in point of physical fact and in terms of seeking out new ideas.

The adventuresome McNaughton's Cuban episode tells something about the man: the tendency for full, unyielding commitment to causes in which he believes. That is not to say McNaughton is fronting for the Havana regime now, but in 1957-59 he believed in the rightness of toppling the Batista government, as did many Cubans and millions of other people around the world.

He ran into Castroite sympathizers in Cuba's Oriente Province in 1957 while on the way to investigate a mining property. As he told *Time* magazine (in its January 12, 1959, edition): "I got to sympathize with what they were doing. My very good friends were giving their lives for the cause. I joined the movement. It was the least I could do."

Then, under the code name Esquimal (Eskimo), McNaughton became a kind of double agent—presenting himself to the Batista government as a purchasing agent with good connections among Canadian arms producers while doing everything he could to make sure Batista did not receive any weapons from Canada. He was already known as a man who had helped deliver arms to Israel on prior occasions.

In the cloak-and-daggery Cuban affair, McNaughton's role was either to make sure no Canadian arms reached Batista, or, should they actually be authorized by Canada for Batista, to hijack them and divert them to Castro.

He actually became an authorized agent in Central American countries for the July 26 Movement, in which lands he had the dual purpose of preventing, where possible, the sale of arms to Batista and at the same time obtaining arms for the Castro revolution. During this period (1957-58) McNaughton as dual agent had experiences of almost Hollywoodesque proportions.

When he sat down to write his memoirs (in the *Montreal Star*) as a short-lived double agent of the Cuban revolution, McNaughton, then an avid fan of Cuba's first provisional president, the democratic non-Communist Dr. Manuel Urrutia, made it clear he was committed to freedom and democracy:

". . . I believe it is the duty of us all to stand up to dictatorships. It is our duty, but is not an opportunity given to every man. When it is given, as it was to me, what ought a man to do? Mind his business [or] do what he can so that one segment of humanity can taste freedom? I chose the latter course and this would always be my choice."

However, it was not so much the Cuban interlude as the alleged Mafia influence that arose among the elements trying to smear Laetrile through McNaughton. Supposed Mafia-connected gifts to the McNaughton Foundation, and alleged Mafia links with a Canadian organization that McNaughton had once set up in Canada, International Biozymes Ltd., were part of a whispering campaign to discredit McNaughton personally.

During the early Laetrile days, when the McNaughton Foundation was operating quite legally in Canada, the sister of an alleged Mafia individual was "kept alive for many years" with Laetrile, McNaughton claims. It is because her brother was "very grateful" and asked what he could do that three gifts—of $100,000, $20,000, and $10,000—were made available through a third party to the foundation. "So that was my Mafia involvement," McNaughton told me one afternoon.

The *Financial Post* in Canada had published on March 10, 1973, a lengthy article entitled "Ultimate Stock Swindle May Involve Canadian Firm and a 'Cancer Drug.'" The article primarily attempted to link McNaughton and the company he once set up—International Biozymes Ltd., later Biozymes International Ltd.—with one Joseph (Bayonne Joe) Zicarelli, imprisoned in 1971 at Trenton State Prison, New Jersey, on a ten-to-fifteen-year term on conviction of conspiracy involving gambling. The latter, identified as a "major mob figure," was also described as a principal shareholder of Biozymes.

It was in 1961 that McNaughton set up International Biozymes Ltd., the reason being, he said, that while he was battling to induce Canadian pharmaceutical companies to produce Laetrile for tests in that country, all companies refused except Delmar Chemicals, Ltd. They refused to engage in business transactions with a nonprofit, tax-exempt organization such as the McNaughton Foundation, since, under Canadian law, such a foundation could not be sued for recovery of damages. Hence Biozymes was set up as a profit-making corporation and continued to make Laetrile for several years, until the mid-1960s when the Canadian Department of National Health and Welfare banned its distribution. In 1963, recalled McNaughton, he and "all my shares" got out of Biozymes and it was taken over by others.

The *Financial Post* article, reproduced and anonymously mailed to me, attempted to insinuate an ongoing relationship between Laetrile, mobsters, and McNaughton, and also detailed the latter's problems with another venture unconnected with Laetrile. To the uninitiated, then, a whispering campaign could and did produce interesting mental scenarios: vague references to Mafia influence, varying and innovative ways to smuggle the product from Mexico, the unconscionable hustling of dying cancer patients for their last pennies.

The evidence militating against all this, though, was the growing thousands

of Laetrile users (the *Financial Post* article stated that "Laetrile is being taken by about 20,000 American cancer patients, most of whom have been told by their doctors there is no hope from orthodox treatment"—a figure I could never confirm), so many of whom attested to objective benefits from the "worthless" cancer fighter.

In various talks I had with McNaughton, it became clear that his foundation was anxiously awaiting the day when the Laetrile problem is solved so it can get out of the cancer therapy controversy and give more time to its next major range of activity. This was not because McNaughton and his advisory board—ranging from Doctors Gurchot, Krebs, and Navarro and the former American Association for the Advancement of Science president Chauncey D. Leake to professors in the Soviet Union and East Germany—believed the heat in the kitchen was too hot. Far from it.

McNaughton flatly believes the cancer battle is on the way to victory, that Laetrile will soon be vindicated. "We have hoped every year to have the establishment steal Laetrile from us and have it an establishment discovery; then we could go full time into parapsychology," he says. For parapsychology is uppermost in his mind as the next primary goal of his endeavors. "Within a short time Laetrile (and its ancillary therapy) will be the established way of treating cancer," he said in 1973. "Then science may have to convince the establishment that the mind is greater in importance."

By no means, of course, do Krebs and many other pragmatic scientists share McNaughton's lifelong enthusiasm over things parapsychological; but several do, including some of the multidegreed savants who are foundation directors.

I had not been aware of this interest of McNaughton's during the time I interviewed the first series of hard-core terminal cases referred to earlier. In those cases, as noted, attitude and religious faith seemed to be playing some kind of role.

In the meantime, Jean Shinoda Bolen, M.D., had published in her husband's magazine, *Psychic* (which I had helped, in a small way, to bring into existence), some of the results of the work of Major O. Carl Simonton, chief of radiation therapy at Travis Air Force Base, California. She wrote (in "Meditation and Psychotherapy in the Treatment of Cancer"): "Major O. Carl Simonton, M.D., . . . is thoroughly convinced that one's state of mind has to do with the development of cancer and must be reckoned with in treating it as well. 'The mind, the emotions, and the attitude of a patient,' he steadfastly maintains, 'play a role in both the development of a disease, cancer included, and the response that a patient has to any form of treatment.' " In a two-year study of 152 cancer patients he treated, Dr. Simonton stated that the patients' improved or unimproved conditions correlated to their degree of participation in his special treatment program and positive or negative attitudes.

Dr. Simonton had begun his interest in the new approach to cancer in 1969 at the University of Oregon Medical Center when he noted that certain patients "inexplicably" lived longer or were "unexpectedly" cured during radiation therapy, patients who beat enormous odds in advanced, terminal

cancer. In talking with these patients, the medic detected a consistent, positive, even stubborn attitude of "I can't die until such and such happens." Then there were the patients who said they wanted to live but whose actions said otherwise—persons with lung cancer who continued to smoke, those with liver cancer who continued to drink—and those who frequently said things like "Maybe I deserved this" or "It's probably punishment for what I did."

Further, Dr. Simonton heard patients describe their life situations at the time their cancers arose; phrases such as "I felt trapped" or "I hadn't much to live for" were frequent. Somehow, the mind had determined the need for death, and the body responded, finding a way—cancer.

Sensing that the mind might very well have a role in inducing cancer, Dr. Simonton turned his attention to whether it could not therefore also have a role in inhibiting the disease. He came up with a series of meditative techniques involving relaxation and visualization and also educating victims about their cancers. Psychotherapy sessions with patients, their families, and friends were included. As Dr. Bolen describes the meditative-visualization process:

> The patient is asked to meditate regularly three times a day for 15 minutes in the morning upon arising, around noon, and at night before going to bed. In the meditation exercise, the first couple of minutes are used to go into a state of relaxation, then once the body is completely relaxed, the patient visualizes a peaceful scene from nature.
>
> A minute later, the patient begins the main part of the work of mental imagery. First he tunes in on the cancer, "sees" it in his mind's eye. Then . . . he pictures his immune mechanism working the way it's supposed to work, picking up the dead and dying cells. Patients are asked to visualize the army of white blood cells coming, swarming over the cancer, and carrying off the malignant cells which have been weakened or killed by the barrage of high energy particles of radiation therapy given off by the cobalt machine, the linear accelerator, or whatever the source is.
>
> These white cells then break down the malignant cells which are then flushed out of the body. Finally, just before the end of the meditation, the patient visualizes himself well.

Along with these processes, Dr. Simonton, the son of a Southern Baptist minister, confronts negative-attitude patients and harangues them about their seeming desire to give up.

In the survey of 152 patients treated with the above method, twenty showed responses Dr. Simonton described as "excellent." Of these, all were said to be highly motivated to live and all cooperated well. Of those with no relief of symptoms or mild relief, none had been fully cooperative or positively motivated. Except for two cases—patients who showed good results despite negative attitudes—all results showed improvement or unimprovement in correlation to their attitudes and degrees of participation.

None of this is mysterious to McNaughton. Cancer has become, he says, a "socially acceptable way to commit suicide."

The McNaughton Foundation was set up, Andrew McNaughton has said, to "look at new ideas, pick the best ones, and help them get going." At this writing the foundation was already active not only in Laetrile, but also in the

aging process (in which it is backing Dr. Krebs's pangamic acid—vitamin B_{15}—as also found beneficial by the Russians), heart disease, diabetes, and a joint library project with the Royal Society of Medicine.

"The McNaughton Foundation intent is to finance innovative approaches to medicine and to close the time-lag between inception and implementation," McNaughton said one afternoon. "In the field of medicine we're very interested in certain aspects of parapsychology which have to do with conscious control of the autonomic nervous system, like meditation, and its effect on medicine, heart disease, high blood pressure. You can't separate the mind from the body—there is too little emphasis on the part the mind plays in therapy.

"We started out with carbon monoxide problems, did some work in psychiatry, provided financial support for the Royal Society of Medicine in computer library retrieval systems.

"How did I get started? My father was president of the National Research Council in Canada. I was brought up in a scientific atmosphere. . . . I became interested in the innovative ideas initially rejected by the establishment with the result that their implementation is delayed for years. Take penicillin, for example.

"We are a valuable organization because we fill a need—to look at innovative ideas, to help put them where they will be scientifically accepted. Then we are interested in dropping them and we look at new concepts. We want to separate the wheat from the chaff, getting the nuggets of pure gold."

When he noted that "we like operating costs to remain small," he wasn't kidding. It was usually McNaughton himself who went from place to place to oversee what was happening to Laetrile at any given time. The foundation operated out of post office boxes in Sausalito and San Ysidro, California, in the 1970s, the latter one known, perhaps puckishly, as P.O. Box B-17. "The McNaughton Foundation has a board of directors, a board of advisers, a widely spread group. Many advise us, none gets paid. The McNaughton Foundation is an idea—it's not like a corporation—trying to put concepts into reality. I felt I was uniquely qualified for this intellectual adventure," McNaughton explains.

Currently, the Foundation's board is a two-man affair—McNaughton as president, and Stephen Zalac, a specialist in nutrition, as vice president. There is an extensive international advisory board.[2]

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2. The stated Advisory Board as of 1971 was composed of Prof. N. R. Bouziane, M.D., Ph.D., director, research laboratories, Saint Jeanne D'Arc Hospital, Montreal; Senator David A. Croll, former minister of welfare and labor, Ontario; Charles Gurchot, Ph.D., pharmacologist involved in cancer research since 1931; Dr. James D. Hamilton, B.Sc., M.A., Ph.D., M.D., connected with two Montreal hospitals; R. T. Hewitt, O.B.E., M.A., secretary, Royal Society of Medicine, England; R. W. Howe, consulting engineer; Ernst T. Krebs, Jr., biochemist; Dr. Chauncey D. Leake, pharmacologist; Dr. Manuel D. Navarro, M.D., F.P.C.P., oncologist, Manila; Dr. Hans A. Nieper, internal medicine specialist, Hannover, West Germany; Dr. Fedor Romashov, professor of surgery, Lumumba University of Peoples Friendship, Moscow; Dr. Fedor Trinus, professor of pharmacology, Ministry of Public Health, Ukraine; Prof. Manfred von Ardenne, president, Manfred von Ardenne Research Institute, Dresden-Weisser Hirsch, East Germany.

McNaughton, involved in the international Laetrile story since its earlier phase and though chafing under FDA regulations and the mass pressure of the anti-Laetrile forces, does not believe there is a coordinated plot against Laetrile. "There is no organized conspiracy, no group that sits down and plans 'how are we going to attack Laetrile today,' " he said. "But there *is* a built-in resistance to new ideas. A radiologist will have a terrific resistance, even at the subconscious level. To a surgeon, it is logical to cut cancer out. Then there are the selfish, egotistical people, best characterized by the [former official], who has testified Laetrile is toxic and under cross-examination admitted he never used it.

"There is not a conspiracy in the sense the John Birch Society uses the term. It is a loose conspiracy of people with similar ideas and similar greeds and of scientists who have taken positions who can't change."

At the end of 1973, the McNaughton Foundation published *Physician's Handbook of Vitamin B17 Therapy*, which combines the established Laetrile therapy with "the role of positive thinking." Not even referring to Laetrile but mentioning only vitamin B17 and amygdalin, the foundation booklet carries this preface by Andrew R. L. McNaughton:

> Cancer, like many diseases, is an expression of conflict between the living organism and hostile factors in the total environment. The mind, through the nervous system, can influence this conflict constructively or destructively. Hence to a varying degree cancer is something which the mind is permitting to happen to the body. From contact with more than 5,000 cancer patients over the past 15 years it is apparent that for many of them cancer was a form of socially acceptable suicide. For best results under vitamin B17 therapy the patient must cooperate mentally and physically, positively and actively, in his treatment.
>
> More often than not, Quitters die, Fighters live.

11

Treating Cancer with a Food Factor

The Laetrile therapy as derived from the work of the Krebses, and growing out of the research of scientists in several parts of the world and the practical experience of Doctors John Richardson and Lawrence McDonald in the United States and Ernesto Contreras in Mexico, is based on the idea that cancer is a metabolic disease and that a combination of intrinsic and extrinsic factors will retard it. The corollary to this, of course, is that the combination of intrinsic and extrinsic factors will probably also prevent it. But the emphasis, going into 1974, was still on treatment.

The argument around which the retrial of Dr. Richardson swirled in late 1973 was that the Albany, California, medic was not "treating" cancer—at least cancer as traditionally defined—*per se*. He was, he argued, treating the metabolism with megavitamin therapy, in which the substance vitamin B_{17} played a key role. He was, in effect, treating the metabolism to shore up its own defense against cancer.

The laetrilists argue that "lump and bump" manifestations of cancer are symptoms, not root causes, of cancer. Indeed, it is the body's reaction to the explosive trophoblast (cancer) cells that causes the lumps and bumps in the first place. The treatment of such lumps and bumps (most radically, through surgery) is only the treatment of a symptom. An analogy can be made to the treatment of the lesions of syphilis before it was discovered that syphilis had a specific (and in this case extrinsic) cause.

Late in 1973, the McNaughton Foundation issued its *Physician's Handbook of Vitamin B_{17} Therapy*. Not mentioning Laetrile by name at all, the booklet stated that "in vitamin B_{17} therapy the cyanide is liberated under safe conditions. Thus adequate dosage is possible without the occurrence of toxic effects. Detoxification occurs in normal mammalian tissue through the action of the enzyme rhodanese in the presence of sulfur-bearing compounds, converting free cyanide to thiocyanate. Cancer cell deficiency of rhodanese may

be a determining factor in the effect of the cyanide upon neoplasms.

"Hydrolysis of amygdalin (vitamin B_{17}) releases hydrocyanic acid, benzaldehyde and two sugar molecules."[1]

Pharmacologist Charles Gurchot, Dr. Ernst T. Krebs, Jr.'s mentor, has appended "suggested mechanisms of action" of the vitamin therapy in the booklet this way. Oral doses of vitamin B_{17} (Laetrile, amygdalin) pass into the intestine where the substance is acted upon by bacterial enzymes. The enzyme complex emulsin breaks amygdalin into four components: hydrocyanic acid, benzaldehyde, prunasin, and mandelonitrile, which components in turn are absorbed into the lymph and portal systems. Cyanide is converted into thiocyanate "probably in the blood circulation, and certainly in the liver by the enzyme of rhodanese in the presence of sulfur-bearing compounds. . . . In cancer patients some thiocyanate finds its way to the site of the cancer lesion."[2]

Prunasin may circulate in the body and reach the malignancy, there hydrolyzing to liberate hydrocyanic acid, benzaldehyde, and a molecule of glucose. Prunasin may also be changed in the liver to mandelonitrile glucuronoside, either by combining with glucuronic acid or by oxidation of the terminal alcohol group of the prunasin glucose molecule.

The mandelonitrile absorbed from the intestine goes directly to the liver, where it is converted to glucuronic acid. It may then be excreted as glucuronide or find its way to a malignant lesion.

Dr. Gurchot states that glucosidic enzymes at the lesion may hydrolyze prunasin into its components cyanide, benzaldehyde, and a glucose molecule, and in the process pure mandelonitrile may be released. Mandelonitrile may then undergo spontaneous hydrolysis to hydrocyanic acid and benzaldehyde.

One suggestion emanating out of the Sloan-Kettering tests in 1973 was that mandelonitrile might actually be the primary tool in tumor retardation rather than cyanide. Barbara J. Culliton, writing in the respected journal *Science* for December 1973 and reporting on the Laetrile tests at S-K, noted:

> Basically, the idea that has been put forward for years to explain Laetrile's alleged ability to kill cancer cells is that it releases lethal doses of cyanide when it is taken up by a tumor.
>
> "Certainly there is some old literature showing that cyanide has anticancer activity," [Dr. Lloyd J.] Old notes. "The question is whether this is so and, if it is, how you can harness the enormous toxicity of cyanide."
>
> The question has yet to be answered fully, but there are now some data to suggest that, rather than cyanide, another chemical—mandelonitrile—may be at work.
>
> One of the scientists on Old's team looked at Laetrile in human tissues and found that they appear to be "incapable of generating cyanide from amygdalin. It was therefore suggested that mandelonitrile might indeed be the putative therapeutic agent resulting from amygdalin," according to a confidential working report. The possibility is being investigated.

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1. *Physician's Handbook of Vitamin B_{17} Therapy*, McNaughton Foundation, San Ysidro, Calif., 1973.
2. *Ibid.*, p. 22.

> Mandelonitrile is at least as toxic as cyanide, Sloan-Kettering researchers point out. The idea behind their work is fairly simple. It may be that there is an enzyme peculiar to tumor cells which is capable of cleaving mandelonitrile from amygdalin, thereby selectively releasing a lethal molecule from one that is nontoxic. As far as is known, amygdalin is relatively safe, even in large doses.[3]

I found the last remark of particular interest in view of the FDA crackdown on the vitamin B_{17}-containing food products and the veiled suggestions made by medical orthodoxy that Laetrile is dangerous because of its cyanide content.

In his introduction to *Physician's Handbook of Vitamin B_{17} Therapy,* Dr. Krebs notes: "Cancer is a chronic metabolic disease in which the host resistance is diminished. All metabolic diseases now prevented or cured are, without exception, prevented or cured by vitamins, minerals, and other factors normal to the diet and to the animal economy. By contrast, no chronic or metabolic disease—or any other disease—*of the host* has ever been prevented or cured by toxic chemicals or by radiation or by anything else foreign to the natural experience of the organism."

He explains the "totality of the pancreatic enzymes" as the "intrinsic, surveillant, antineoplastic factor" which, alone, blocks the development of cancer. Second to them as the intrinsic factor, he says, is the immunological system, particularly in its lymphocytic function. Whatever can break away the protective "shield" around the cancer (or trophoblast) cell allows the immunological system to go to work and also to expose it "to further digestion by the 'deshielding' enzymes themselves."

The control of cancer—called by Krebs "the trophoblast external to gestation"—is thus not only under the "surveillance" of the intrinsic enzymes and the immunological resources of the host, but also, in his opinion, under the "naturally selected surveillance of dietary or extrinsic enzymes brought into the organism."

This forms the rationale for the Laetrile therapy's heavy reliance on fresh and raw plant material rather than on cooked foods even when supplemented with all the known vitamins and required minerals. "Dietary deprivation of enzymes or vitamins or minerals may be decisive in the proper functioning of the immunological forces of the body," he notes in the introduction.

Current Laetrile treatment centers around a dosage of three grams of Laetrile per day, with a range of one to twelve grams per day, the handbook's "general clinical routine" points out. The upper limits of dosage use are calculated on the basis of 300 milligrams of vitamin B_{17} per kilogram (2.2 lbs.) of body weight. Hence, the upper limit of dosage for a 154-pound adult would be about twenty-one grams a day.

The substance may be given orally (in tablets ranging from 100- to 500-milligram doses or broken up and added to soft food), intravenously, in-

3. Barbara J. Culliton, "Sloan-Kettering: The Trials of an Apricot Pit—1973," *Science* (December 1, 1973).

tramuscularly, intrapleurally, intrauterinely, and through direct application. Dosage changes may be determined by the sense of well-being a patient exhibits.

The McNaughton booklet describes a total dosage "in excess of 300 grams" over a period of time as the average amount "in controlling a moderate cancer crisis." A "severe cancer crisis brought under control may be maintained in a quiescent state by the oral administration of 1 gram . . . daily," it adds.

In a general letter to physicians circulated by the Committee for Freedom of Choice in Cancer Therapy, Dr. John A. Richardson, the embattled California medic, states: "We generally say that a patient who has clinical cancer will be regulated or controlled with 50 grams of Laetrile. That is about 17-20 injections of 3 grams each."

As Laetrile is provided, cancer patients are asked to adhere to a special diet and are routinely prescribed pancreatic enzymes, bromelin, calcium supplements, and calcium di-orotate. Accessory therapy recommended but not routinely prescribed includes vitamin B_{15} (pangamic acid—the other Krebs discovery not officially accepted or labeled as such by medical orthodoxy), vitamin C, vitamin E, and vitamin A.

A special dietary regimen is recommended for strict adherence for the first three or four months of therapy and may be gradually relaxed following improvement. Based almost solely on fresh fruits and vegetables and/or their fresh juices and to the exclusion of meat, other than the frequent use of fresh fish and the occasional use of poultry cooked without the addition of fat or salt and not treated with hormones, the Laetrile diet is:

PLANT FOODS: All edible plants and fruits, preferably eaten raw and as fresh as possible. Some may need cooking just enough to make them edible. "Brief and judicious cooking for such periods and at low heat (as done in Chinese restaurants) will not appreciably destroy enzymes in foods." The plant food should be free of additives and preservatives. Whole grains are preferred to refined flour. All sprouted grains are most desirable.

ANIMAL FOODS: Fish and poultry should be baked, boiled, or broiled, but never fried, and should be prepared without salt or animal fat. Avoid any animal food of any kind that is neither fish nor poultry.

TEA, COFFEE: May be used moderately, but without any sweeteners, and generally should be avoided. Herb teas suggested as substitute.

TOBACCO: Should be strictly avoided.

SWEETENERS: Should not be added to any food. The avoidance of sugar and products containing sugar is essential.

In terms of hygiene, the booklet recommends that patients not remain in a room with a smoker, that they increase their oxygen intake with exercises in the open air and away from known sources of pollution, that they take daily warm baths, evacuate their bowels at least once a day, sleep "adequately," avoid permanent-wave lotions, toxic hair sprays, synthetic cosmetics, antiperspirants and lipsticks made out of coal-tar dyes, and view television "as

little as possible."

The last is in response to studies indicating that small doses of X-irradiation cause abnormal activity in plant and animal cells and that X-irradiation dosages are in fact cumulative.

Throughout the therapy, patients are given urine tests for the presence of the human chorionic gonadotropin (HCG) hormone.

When a "cancer crisis" has been successfully controlled for more than two years, with patients showing good objective responses in weight gain, increased strength, return to a more nearly normal state of activity and vigor, exhibiting negative HCG tests and showing an improvement in X-rays or other objective evidence, the maintenance of B_{17} may be reduced to "dietary levels" of nitriloside of at least 500 milligrams per day.

The McNaughton handbook states that "there are no contraindications to the use of vitamin B_{17} and-or the proteolytic enzymes along with surgery, radiation, and the cytotoxins." Hence, as the National Cancer Institute's Dr. Dean Burk has consistently pointed out, there is no good reason why a cancer patient may not take Laetrile along with other therapy.

The various practitioners around the world approach their overall Laetrile therapy differently, anxious to blend the best possible results from the known forms of cancer therapy. Dr. Hans Nieper of West Germany is by no means exclusively a "Laetrile doctor"—he simply has used amygdalin successfully in a variety of cases along with other treatments. Nor are Dr. Ernesto Contreras and his staff in Tijuana specifically "Laetrile doctors"; they use amygdalin along with other forms of treatment including, depending on the nature of the disease, radiation and surgery.

The McNaughton handbook states the laetrilist position on surgery, radiotherapy, and chemotherapy, the approved approaches to cancer control, this way:

> All forms of radiation can in one degree or another shrink benign as well as neoplastic tumors. Many of the cancer chemotherapeutic agents are similarly capable of shrinking tumors, malignant or benign. Unfortunately any shrinkage is gained at [the] cost of destroying somatic cells, especially the primitive repair cells.
>
> Although many benign tumors are radio-sensitive, and while the trophoblast growths of the chorionepitheliomas and similarly highly malignant undifferentiated cells are radio-resistant, the radiation may increase the proportion of neoplastic cells in the tumor, making the index of tumefaction a misleading and unreliable criterion of antineoplastic therapeutic response.
>
> However, surgery is often life-saving in cancer by correcting blockages, repairing fistulas, correcting hemorrhage, reconstructing plastic damage, and the like.
>
> If surgery can remove a tumor completely, as in early nonmetastatic cancer of the uterus, it may conserve the health and life of the patient. The same applies to the use of surgery in preneoplastic hyperplasias, and polyps, papillomata, skin lesions, leukoplakia, senile keratoses, etc. Where rational surgery is used, B_{17} and proteolytic enzyme therapy is not contraindicated in any way, and is indicated even before surgery.
>
> Since pulmonary neoplasms appear to be especially responsive to the use of

vitamin B17 and proteolytic enzymes, such an approach is the preferred method of treatment.

Except for lesions in or close to the skin, radiation or the radio-mimetic cytotoxins are to be avoided because of their highly immunosuppressive and other destructive effects.[4]

The general megavitamin therapy experience of Doctors Richardson and McDonald, in California and Georgia, respectively, involves avoidance of chemotherapy and radiation. Other clinicians occasionally mixed these "orthodox" forms with the Laetrile-based vitamin therapy. The general consensus of every practitioner I talked to was that advanced cancer cases previously treated with these customary approaches made the "control" aspects of Laetrile ever more difficult. The fact that the vast majority of American patients who ultimately turned to Laetrile (whether from Contreras, Nieper, Richardson, McDonald, or anyone else) were already described as "terminal" patients greatly clouded the efficacy of Laetrile as a "control"—for, as stated, no claims were made that Laetrile therapy could restore lost or damaged tissue. Many patients were simply too far gone to be "saved"; yet, overwhelmingly, Laetrile therapy patients reported palliation.

Dr. McDonald's one-year experience with Laetrile and megavitamin therapy in Georgia convinced him, he told me, that all eighty of his patients had shown palliative symptoms from the Laetrile-vitamin approach, particularly decrease in pain, renewed appetite, and increase in living time. "So many who come in are at the point of death, after extreme radiation and chemotherapy. Chemotherapy seems to be worse than radiation—it really knocks the body for a loop," he said.

McDonald added that it was his brief experience that patients who were at the time cancer-free but had had a past history of malignancies, had the best response to the therapy. The phrase "I've never felt better in my life" summarized their response to metabolic therapy.

The Atlanta urologist, once skeptical of Laetrile and learning of the details of Laetrile therapy and the trophoblast theory at a San Francisco seminar, also said: "I had heard of trophoblast, but never the trophoblast concept. American doctors get no instruction in nutrition. No wonder American medicine has a blind spot. We generally are taught to believe the American diet is the best, that the stable American diet is good in nutrition. Sure, we get filled and people look happy, but that shouldn't be confused with nutrition.

"Medical schools simply do not teach nutrition. I had no nutrition in four years of medical school—oh, I guess one lecture, but I was out delivering a baby at that time," he said.

From the new wave of treatment, investigation, and open—if illegal—use of Laetrile in the United States, and from information continuing to come in from around the world, came the most tantalizing of possibilities, quite in line with biochemist Ernst T. Krebs, Jr.'s dream: In nutrition lies not only much of the "control" of cancer, but very likely its prevention.

4. *Physician's Handbook of Vitamin B17 Therapy*, p. 18.

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The Case Against Laetrile—And Hope for the Future

The case against Laetrile, whether stated by the Food and Drug Administration, the American Medical Association, the American Cancer Society, or state departments of public health, includes these elements, each and every one of them disputed in whole or part by Krebs, Burk, and the Laetrile physicians around the world:

- That sufficient case data on clinical use of Laetrile have not been brought forward.
- That the existing data on Laetrile show it to be of no real effect in combating cancer. Ditto the urine test for the detection of cancer through HCG release.
- That the real danger in Laetrile use, aside from veiled references to its cyanide action, is that the individual who turns to it will frequently do so in lieu of recognized or orthodox treatment.
- That the chemistry claimed in Laetrile action is not necessarily consistent with what actually happens in the body; that is, the Krebs premises do not actually hold up.

Then, of course, the inferences that can be drawn from the FDA and related actions against Laetrile and the Laetrile-bearing products "Bee Seventeen" and "Aprikern," and even against apricot pits themselves, are ultimately more compelling to the layman. Since the admitted active ingredient in the Laetrile attack on cancer is cyanide, and cyanide is a poison, then, *ipso facto*, Laetrile and Laetrile-bearing products are dangerous, particularly as to the assumed degree of cyanide poisoning.

The rationales advanced to explain "control" claims of Laetrile-using patients, and frequently stated to me, are these:

- The individual in question may never have had cancer in the first place.
- If he is responding well now, or seeming to respond well now, it may be because he is finally responding to the orthodox treatments he had earlier received.

• The individual may have undergone "spontaneous remission" of symptoms.

To update myself as much as possible on the "case against" Laetrile, I asked the American Cancer Society a number of specifics. The answers, researched and relayed to me very kindly by Charles Dahle, director of public information, American Cancer Society, California Division, included the following:

(Question as to whether the ACS has sponsored research into nutritional or vitamin factors in the possible prevention or treatment of cancer:) "In recent years the American Cancer Society has not sponsored research into nutritional or vitamin factors in the possible prevention or treatment of cancer, primarily because no applications from scientists have been received.

"There have been a few scattered projects of this kind in earlier years, but these have been mainly epidemiological. Most research touching on nutritional factors has been epidemiological. It is my understanding that it has uncovered no significant dietary factors relating to cancer."

(Question as to whether ACS has attempted to investigate the claims made by proponents of Laetrile, particularly after 1963, and if not, why not:) ". . . The Society has been unable since 1963 to fund more than a portion of the scientifically approved research applications it has received. Unfortunately, claims made for Laetrile have not stood up under scientific scrutiny. Since investigations of this product have been adequately carried out by others, nothing would be gained by diverting funds for the purpose of going back over old ground.

"It is my understanding that since 1963 the California State Department of Health has been most receptive to the making of studies on Laetrile, but that its efforts in this direction have been hampered by failure of Laetrile proponents to supply verified case histories for examination. . . ."

(Question as to amount of funds made by the Cancer Society in its annual fund drives and how they are allocated:) "During its 1971-72 fiscal year the American Cancer Society received a total of approximately $79 million in contributions and legacies. The allocation of these funds for the 1972-73 budget can be considered typical, and will be found on page 29 of *Cancer Facts & Figures*. During the 1972-73 fiscal year the Society received approximately $93 million in contributions and legacies."

The breakdown of allocations referred to for the 1972-73 budget of $79,328,000 was: 30.3 percent for research ($24,076,100); 18 percent for "public education" ($14,246,000); 13 percent for patient services ($10,290,500); 11.2 percent for fund-raising ($8,913,300); 10.9 percent for "professional education" ($8,645,100); 10 percent for "management and general" ($7,954,700); and 6.6 percent for "community services" ($5,202,300).

(Question as to the cost of cancer to individual patients:) "Information on the cost of cancer to individual patients is difficult to compile because of the varying nature of the disease and the treatment it requires. Averages,

therefore, would not be too meaningful even if they were available." I was referred to *Cancer Facts & Figures* as to cancer costs.

My interest here was trying to track down facts and figures to support or demolish the claims that cancer represents a mammoth industry worth billions of dollars. One source, *California Business* for November 9, 1972, had indicated upwards of a $12 billion per year cost (estimated median expenditures per cancer patient). I had variously heard the amounts a cancer patient ultimately pays during the entire course of therapy as estimated at median ranges of anywhere from $13,000 to $30,000—certainly much more in many cases, and less in others.

The ACS's 1974 *Cancer Facts & Figures* states (p. 28):

> The nearest approximation of the direct costs of cancer was arrived at some years ago by the President's Commission on Heart Disease, Cancer and Stroke.
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> Personal services, such as hospital and nursing home care, physicians' and nurses' services and drugs, were put at a $920.7-million total, with nonpersonal services, such as research, training, construction, insurance, health services, etc., adding another $326.8-million. That comes to nearly $1.25-billion, and the year was 1962. At the ACS National Conference on Human Values and Cancer, at Atlanta in June 1972, an American Hospital Association director put that figure at $3 billion, an increase of 150 percent in 10 years.
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> The 1962 report cited cancer illness among those under 65 as costing 72,000 man-years of productivity among the labor force; 44,000 man-years among those keeping house, and 52,000 man-years among those unable to work.

(Question as to whether the American Cancer Society has a controlling interest, in, or substantial patents on, the chemotherapy drug 5-FU fluorouracil. This point was frequently raised by laetrilists to suggest such a link between the ACS and one of the heavily toxic "drugs of choice" that a vested interest in the society to oppose a relatively simple—let along inexpensive—answer to cancer might be inferred:) "The American Cancer Society frequently has been libeled and slandered about alleged profits received from patents on anti-cancer drugs.

"The only patent held by the American Cancer Society is for the drugs 5-FU and 5-FUDR. The Society's ownership consists of ½ of ½ of an undivided interest. The owner of the other ½ of ½ of undivided interest is the U.S. government.

"The Society's ownership rights were held to guarantee that opportunities would be provided for licensing and manufacturing these drugs in the event that other owners of the patent decided not to make it available to the public. This eventuality did not occur and is no longer considered a possibility, because the drugs are now in common use. At no time has the Society profited from cancer, nor does it expect to. No royalties have been received or are payable to the Society or any of its Divisions."

Additionally, Mr. Dahle said in answer to other questions, more than 100 basic kinds of cancer have been identified and "if all of the variations of the

basic cancers were counted separately, the number of different cancers would add up to 200 or more.

"Because cancer is considered to be a group of diseases rather than a single disease, many experts have concluded that no single cure for cancer is likely to be found. Instead, they believe that treatment for each of the different cancers will have to be tailored to its individual characteristics."

Moreover, the ACS spokesman pointed out, "more than 1,000,000 Americans will be under treatment for cancer in 1974. Of these, an estimated 655,000 cases will be newly diagnosed. Approximately 355,000 will die, but the lives of about 218,000 will be saved."

The ACS's *Cancer Facts & Figures* for 1974 points out that the death rate from cancer accelerated in 1972 at the fastest pace in twenty-two years. This figure, summarized from the National Center for Health Statistics, was also accompanied in an ACS press release with a terse explanation: "The blame was placed on greater exposure to cancer-causing chemicals in the environment."

I was more than a little dumbfounded at the response I received from the society. I was baffled that at a time when at least several thousand Americans were claiming some kind of relief from an "unorthodox" cancer fighter and while the American Cancer Society was taking in $93 *million*, its last stated budget of about $79 *million* provided *no* funds at all for an investigation of new evidence about Laetrile, or even any monies for research on nutritional and vitamin therapies.

The ACS's official position on Laetrile had not changed at all since I first read it in 1971: "After careful study of the literature and other information available to it, the American Cancer Society does not have evidence that treatment with Laetrile results in objective benefit in the treatment of cancer in human beings." Again, the California studies on Laetrile are the basis on which the prohibitions against interstate shipment of Laetrile and conclusions of worthlessness were ultimately based.

The 1953 California Cancer Commission report, with its ambivalent wording and low stated dosages on forty-four patients, and the lack of familiarity of any of the members of the commission with the substance, was followed by a report ten years later that in essence backed up the 1953 report. A supplemental report to that one followed in 1966, based on fourteen clinical records submitted by the McNaughton Foundation and the North End Medical Center, both in Montreal, Quebec. "These were not complete records but were abstracts furnished by the various hospitals in Canada to the McNaughton Foundation," stated the California Cancer Advisory Council's preface.

This supplemental report found that the clinical studies, variously describing types of palliation from Laetrile, were "inadequate." It also included a *Canadian Medical Association Journal* study which cast doubt on the chemical mechanism claimed by laetrilists.[1] It was dealing with two

1. Leo Levi, W. N. French, I. J. Bickis, and I. W. D. Henderson, "Laetrile: A Study of Its Physicochemical and Biochemical Properties," *Canadian Medical Association Journal* 92 (May 15, 1965): 1057-61.

varieties of the substance then being manufactured.

Federally, the National Cancer Institute in Bethesda, Maryland, reported in 1960 that it had tested Laetrile on mice with transplanted tumors with negative results. In subsequent animal tests, at NCI, the fact that varying experts could reach opposite conclusions as to the effectiveness of Laetrile on mouse tumors is best demonstrated by the one-man battle of the NCI cytochemistry chief, Dr. Dean Burk, who argued that tests on mice *did* demonstrate the effectiveness of the substance. His statistical analyses of the several NCI animal studies with Laetrile reached conclusions opposite to those put forth by the governmental body. He was also outspoken in his detailed assessment of the early, but mixed, results of the Sloan-Kettering tests.

Concerning the latter research, both proponents and opponents of Laetrile agreed that full-scale efficacy of the substance in mouse tumors could not conclusively be related to what it might or might not do in human tissues. In a telephone interview I had with one member of the Sloan-Kettering team, it was obvious that some key questions—such as the presumed amounts of beta-glucosidase (the alleged cyanide releasing factor at tumor sites) in mouse and human tissues—had not yet been answered. From the Laetrile point of view, however, the existing human usage of the substance around the world was its own best argument for moving right ahead to clinical (human) tests in the United States. That such officially sanctioned tests would eventually be on the way seemed certain as 1974 began.

But as the year began, inquiries to the FDA on the part of cancer patients tended to bring the same, prior official statements. An NCI letter to Rep. James C. Cleveland of April 3, 1973, concerning a New Hampshire cancer patient, became a relatively standard rebuttal to the claims made by Laetrile proponents: "In order to resolve the conflicting reports obtained in experiments with laboratory animals, the National Cancer Institute over recent months has again conducted tests of Laetrile, both alone and in combination with beta-glucosidase in a variety of experimental tumor systems," read the letter from the NCI acting director. "No evidence of reproducible antitumor activity has been found. Inasmuch as the Institute has now completed its testing of Laetrile, funds are no longer allocated for evaluation of this drug."

That conclusion, of course, directly contradicts the findings of Dr. Burk and inferentially contradicts the findings of some of the Sloan-Kettering tests. Nonetheless, such decisive statements constituted the official position on Laetrile.

At the beginning of 1974, I made a final effort at seeking out a demonstrably effective rebuttal case to the claims made by the Laetrile proponents. Surely, I thought, California state authorities might have on hand (a) an example of a continual Laetrile user who had never at any time received, or even thought he received, any benefits from use of the substance; (b) a solid case of a patient whose premature death from cancer could demonstrably be linked to dependence on Laetrile to the exclusion of the standard treatments; or (c) a solid case of near fatality or other demonstrated severe toxicity from Laetrile

use. It's true that my probe was a telephone one. Nonetheless, the best evidence suggested to me by public health officials, again, was the 1953 test results.

As indicated, the 1953 results constitute only the thinnest and most superficial attack on Laetrile—a very weak argument, indeed, on which to base persistent refusals to move ahead with officially sanctioned tests on humans in 1974. But the official positions and statement stuck as far as organized, orthodox medicine was concerned. Laetrile remained, at least officially, a taboo subject. Any mention of it in professional circles usually sparked an emotional response. With a cancer death rate achieving a twenty-two-year high in the United States, it was understandably difficult to approach the epidemic of cancer with other than a display of emotionalism.

Going into 1974, Laetrile was still certain to get a sharp putdown from outstanding specialists. Jesse Steinfeld, the former U.S. surgeon general who had also been a member of the California Cancer Advisory Committee, and whose early denunciation of Laetrile was the ever-recurring basis for subsequent actions against it, was still on hand to say: "There just were not any anti-tumor effects [from tests on Laetrile]. It's been tested and retested over the years without success."

He was quoted, along with Mayo Clinic specialist Dr. David Carr, in the *Rochester* (Minn.) *Post-Bulletin*, the daily newspaper in the Mayo Clinic's hometown. Between January 21-25, 1974, the newspaper joined the small but growing number of publications that had done in-depth studies of Laetrile. The *Post-Bulletin* quoted Carr: "There is just no valid scientific evidence that Laetrile checks cancer."

The newspaper, however, interviewed numerous Minnesota-area Laetrile users, among the hundreds of Minnesotans who had joined the thousands of Americans making the trip to Tijuana in 1973. As in my own Bay Area interviews, the *Post-Bulletin* interviews produced a consistent pattern of varyingly positive results from Laetrile users, ranging from relief of pain to actual regression of tumors. The newspaper also turned up rigid refusals by authorities and cancer specialists to acknowledge any of these testimonials.

As a California State Public Health Department spokesman had told me on several occasions: "Any quack cure can turn up testimonials. We're not interested in testimonials. We want solid medical case histories." Although I did indeed see several sets of credible medical case histories, there was no single, solid set of documents that would apparently meet the criteria demanded by officialdom: diagnoses of cancer made in the United States by reputable physicians, with treatment by Laetrile (and its ancillary therapy) only and exclusively from the onset of the symptoms.

The vast amount of Laetrile patients remained those already adjudged terminal—literally given up for dead or simply told to get used to the idea. This meant that before turning to the apricot-pit extract they had, in the great majority of cases, already been treated with chemotherapy, radiation, or surgery, or a combination of these. What happened to them afterward could be applauded or decried by orthodoxy depending on the outcome. Though expe-

rienced clinicians around the world had dealt with thousands of Laetrile patients, their data and reports were simply unacceptable to American orthodoxy.

In California, birthplace of the Laetrile research and development, statements by California officials continued to suggest that not only is Laetrile worthless, but, because of its cyanide action, may have a toxicity factor. In an American Cancer Society statement circulated in 1973 and entitled *Questions and Answers on Quackery*, Grant Leake, program supervisor of the California Food and Drug Section fraud unit, and Dr. Ralph Weilerstein, former executive secretary of the California Cancer Advisory Council, reserved their harshest attacks for Laetrile. Dr. Weilerstein stated: "The number of quacks may be decreasing, but I see a marked increase in the well-organized promotion of certain quack remedies, primarily Laetrile. This promotion seems rather skillful, uses up-to-date advertising and public relations techniques, and makes excellent use of the media. Hiding behind the constitutional guarantees of freedom of speech and freedom of the press, the quack promoters are getting their message across." Stating that, as to Laetrile testimonials, "absolutely none . . . has ever been proven," he added, "We know that many persons who give testimonials never had cancer. Others had orthodox treatment in addition to a quack remedy and, although they are more than willing to swear that it was a quack remedy that helped them, it was no doubt the surgery, radiation or chemotherapy."

Moreover, he stated in the officially sanctioned "questions and answers": "Over the past 20 years there have been animal studies, chemical studies, review of theory and extensive reviews by medical groups and the courts of case histories submitted by the proponents. Laetrile's proponents admit that it's been given to thousands of persons. And yet they cannot produce even one medically substantiated case which shows any beneficial effects—not one."

Leake states, in the same document:

> Be suspicious of anyone who talks of secret cures, of persecution by the "medical establishment," who makes a difficult diagnosis on the first examination, or warns against consulting another physician. The charge of a worldwide conspiracy to keep a cancer cure under wraps just doesn't hold water. Doctors, researchers and their families die of cancer too. If they knew of any cure, they'd use it. These so-called remedies are not used on the other side of the Iron Curtain either, so how can it be a profit-making plot?

While the honest intent of the above statements is unquestioned, the inferences to be drawn from them left me with unanswered questions. Just as a terminal cancer patient seemingly undergoing partial or total control of his disease cannot with total certainty claim that Laetrile is the reason for the control, by no means can orthodox medicine with total certainty make the claim that such control is the result of the tardy success of surgery, radiation, or chemotherapy. The remarks about doctors and their families, of course, skirted the reality that a growing number of physicians in the States *do* use Laetrile.

Clearly, officialdom and medical orthodoxy are hedging on the question of Laetrile. I do not wish to indicate I believe they are hedging because of a binding, monolithic conspiracy, however much vested interests may—and probably do—inevitably play a role. The people who make up officialdom and medical orthodoxy are, after all, only human beings, equipped with a full range of strengths and weaknesses. But ego concerns and entrenched attitudes, be they ultimately based on false premises or not, are also clearly evident in the American cancer tragedy. Nobody wants to say, "I was wrong." It is, in a sense, insulting to the modern medical mind to be told, for example, that cancer is little more than a vitamin-deficiency disease and that it may be susceptible of a treatment no more complicated than adequate diet.

Nor do I hurl criticism at rank-and-file physicians and rank-and-file bureaucrats. They—we—all tend to follow the leader. They and we all seek a certain amount of refuge in the known, the presumably demonstrated, the safely orthodox. It is no crime to behave in this distinctly human fashion.

While, again, I do not write off officialdom and orthodoxy as parts of a conspiratorial whole—venal, evil beings meeting together to plot the next operation aimed at making the human race sicker—I certainly cannot (and I believe no journalist can) take the opposite stance, either: that the growing wave of Laetrile testimonials come from people who don't know what they're talking about, people who either never had cancer in the first place or are responding to some previous orthodox treatment; that those involved in Laetrile are a sideshow of kooks, freaks, criminals, extremists, and sundry fanatics (however much some fanaticism and some extremism are indeed present); that responsible scientists, doctors, and researchers around the world who have been involved with Laetrile in various stages of its development and advance are parts either of a criminal conspiracy or of a mutual admiration team of pseudoscientists; and that, ultimately, Laetrile is a giant, sinister con game whose target is the growing number of terminal cancer patients virtually abandoned by modern science.

That Laetrile may soon be vindicated in the United States after almost a quarter century of suppression, that Krebs may be right about the nature and prevention of cancer, will be testimonials to an ever-recurring reality in human events and nature itself: the answer to complicated problems is often simplicity itself.

While human technology, geometrically expanding at a rate faster than human emotions and mentality can keep up with it, runs roughshod over nature, we may very well have overlooked an infinite number of simple solutions to the problems that beset us as a species. This will probably turn out to be true about energy, pollution, and diminishing natural resources, and doubtless will be true in medicine. The nation that consumes billions of pills per year for virtually every illness, real or imagined, is the nation with a runaway cancer epidemic and growing statistics to indicate that that nation is getting sicker, not healthier. Surely, something is wrong somewhere. In medicine in general and cancer in particular, surely something, something very crucial, has been overlooked. The answer may be so simple as to be staring us in the face.

This something may very well be that cancer arises as a natural part of the life cycle, runs unchecked only because of man's uninformed and unintentional tampering with that cycle, and surely has a natural use and inhibitor within that life cycle. This may be true—probably *is* true—for virtually every disease. There is nothing naturally malignant in the universe, insists Ernst Krebs, Jr. This is a profoundly religious statement.

It is Dr. Dennis Myers, a young M.D. in San Francisco who is working with Laetrile's effect on sickle-cell anemia, who sums it up best, I believe. Perhaps a harbinger of a new wave of medical men who think in terms of a universal, organic totality, Dr. Myers has made this the slogan of his medical practice:

"Disease is a contradiction with God. It begins in the Mind which passes it to the feeling nature. This feeling body can manifest it as a neurosis or psychosis or can pass it on to the physical form where it will manifest as a physical ailment. Diagnosis is intuitive and simple. Treatment consists simply of responding to the situation with sincerity. The situation reveals the cure, when it is Time."

Appendices

The following papers, assembled by the McNaughton Foundation from the writings of Ernst T. Krebs, Jr. and his collaborators, are reproduced here to provide a scientific background to the theory and practice of vitamin B_{17} (Laetrile, amygdalin) therapy, the encompassing research on the vitamin B_{17} preventative aspects of cancer, and the "unitarian or trophoblastic thesis" on which much of Krebs's approach to the cancer problem is based.

I

THE NITRILOSIDES IN PLANTS AND ANIMALS

Nutritional and Therapeutic Implications

Ernst T. Krebs, Jr.

John Beard Memorial Foundation

Since the principal objective of this presentation is a study of the clinical use of the Laetriles (nitrilosides) because these substances yield nascent HCN when they undergo enzymatic hydrolysis *in vivo*, it will be helpful if one begins with a general study of the nitrilosides in plants and animals.

A *nitriloside* is a naturally occurring or synthetic compound which upon hydrolysis by a beta-glucosidase yields a molecule of a non-sugar, or aglycone, a molecule of free hydrogen cyanide, and one or more molecules of a sugar or its acid. There are approximately 14 naturally occurring nitrilosides distributed in over 1,200 species of plants. Nitrilosides are found in all plant phyla from Thallophyta to Spermatophyta.

The nitrilosides specifically considered in this paper are l-mandelonitrile-beta-diglucoside (amygdalin) and its hydrolytic products; l-para - hydroxymandelonitrile - beta- glucoside (dhurrin); methylethyl- ketone- cyanohydrin- beta- glucoside (lotaustralin); and acetone-cyanohydrin-beta-glucoside (linamarin). All of these compounds are hydrolysed to free HCN, one or more sugars and a non-sugar or aglycone. For the purposes of this study they may be considered as physiologically and pharmacologically identical and varying essentially only in the per cent of free HCN they produce upon hydrolysis by beta-glucosidase.

The concentration of nitrilosides in plants varies widely and ranges from small traces to as much as 30,000 mg./kg. in some of the common pasture grasses (in the dry state). There is no evidence that animals synthesize nitrilosides under normal conditions. The metabolism of all the higher animals, and most of the invertebrates as well, involves the hydrolysis of plant-derived nitrilosides ingested in the plant components of the diet. This hydrolysis is produced by beta-glucosidase occurring in the gastro-intestinal tract and produced in various tissues of the animal. The enzyme occurring in the intestinal tract is produced by various bacteria or microflora. When the enzyme so produced or that enzyme existing in the organs acts to hydrolyse the nitrilosides to free HCN, sugar and a non-sugar moiety the CN ion

released is detoxified or converted by an enzyme normally occurring in the organism and known as *rhodanese* or thiosulfate transulfurase. The product of such conversion is thiocyanate, a compound found in the tissues of all vertebrates, many invertebrates and a number of plants.

It is one of the objectives of this report to survey extensively but not intensively the indispensable but long-overlooked role of the nitrilosides in the plant and animal kingdoms. The material utilized for this paper comprises, to a large extent, an abstract of a book now in preparation on the subject. The latter carries a bibliography in excess of 3,000 titles. It is not possible in this report to supply an adequate bibliography. We have, therefore, limited the references in this paper, as a rule, to isolated or specific experimental observations; and we have omitted the citation of reference sources for data that are commonplace or unquestioned facts in the universe of the relevant expert. For this reason statements undocumented here may often appear extraordinary to a reader not intimately acquainted with sophisticated data derived from disciplines often distant from his own. For example, even to experts in animal husbandry, agriculture, pharmacology, and toxicology it may come as an almost unbelievable statement that cattle in the course of grazing may daily ingest grasses containing as much as 30,000 mg./kg of nitriloside (carrying over 2.0 grams of derivable HCN) over a period of years without discernible effect. The grasses involved have, however, been repeatedly assayed by reliable and universally accepted techniques and the quantities ingested by sheep and cattle have been repeatedly and carefully measured. The results have been duly published in acceptable journals over the world. For such data the bibliography will be supplied to the reader upon request. We shall offer, often of necessity in a highly abridged form, factual foundations for our study, which foundations have not yet become accessible as a part of any organized discipline. For the often extensive data comprising such foundations, a detailed bibliography is available to the reader upon request.

NITRILOSIDES AND NITRILES IN TERMS OF BIOLOGICAL EXPERIENCE

Nitrilosides are produced by, and HCN enters into the metabolism of, members of the plant kingdom extending from bacteria, moulds and fungi to the common fruits—apricots, peaches, cherries, berries, and the like—comprising the Rosaceae and extends through the Leguminosae—lima beans, vetch, pulses, clovers—to the Graminae with over eighty grasses of the latter family carrying one or more specific nitrilosides.

No area of the earth that supports vegetation lacks nitriloside-containing plants. Over 30 per cent of *all* tropical plants, edible or unedible by man or animals, contains a nitriloside. From the nitriloside-rich salmon-berry, cloud-berry or buffaloberry (Rubus spectabilis) growing on the Arctic tundra and the arrow-grass growing in arctic marshes and supplying the major fodder for the caribou, to the cassava or manioc—the bread of the tropics—plants extraordinarily rich in nitriloside, and serving as food for man and animals, are found in abundance. All life on earth participates directly or indirectly in the chain of nitriloside metabolism. In terms of living forms, the nitrilosides appear as ubiquitous in time as they do in space. There is some evidence that life on earth commenced in conjunction with hydrogen cyanide. The ubiquity of it normally occurring as glycosides in plants was well established before animal evolution had reached the vertebrate level.

A glance at the vegetation about us almost anywhere will disclose nitriloside-containing plants. The common weed and fodder, Johnson-grass, often carries 15,000 mg/kg or more of nitriloside. A similar concentration is found in Sudan-grass,

Velvet grass, white clover, the vetches, buckwheat, the millets, alfalfa or lucerne, lima beans, even some strains of green or garden peas, the quinces, all species of the passion-flower, the seeds as well as the leaves and roots of the peaches and various cherries are but a few of the natural sources of this essentially non-toxic water-soluble factor.

METABOLIC ROLE

Though the nitrilosides are plant-produced, we are interested here only in their metabolic role in the animal kingdom. We know that they account largely if not exclusively for all the thiocyanate found in the tissue and body fluids of animals. Thiocyanate is found in the serum, urine, sweat, saliva and tears of man and lower animals. Thiocyanate as well as its natural precursor, the HCN derived from dietary nitrilosides, supply the cyanide ion for the nitrilization of the precursor of vitamin B-12 (hydrocobalamin) to vitamin B-12 (cyanocobalamin).

Upon hydrolysis in the intestinal tract of man or animals the nitriloside exerts a variable antibiotic effect through the action of the freed hydrogen cyanide and, in the case of some nitrilosides such as amygdalin or dhurrin, through the antiseptic action of benzaldehyde or p-hydroxybenzaldehyde aglycone. The latter from Johnson-grass, before and after oxidation to a benzoic acid is about 30 times more antiseptic (in terms of the phenol coefficient) than ordinary benzaldehyde or benzoic acid.

It is now experimentally established that *only* those nitrile compounds that are hydrolyzed to *free hydrogen cyanide* lend themselves to the formation, through rhodanese in the presence of utilizable sulfur, of thiocyanate.

EXCRETION. After metabolism in the animal body, most of the HCN moiety is eliminated as thiocyanate in the urine with possibly some being eliminated in the faeces. In man a small percentage of the nitriloside-derived HCN may be excreted through the lungs and even in the urine. In rabbits the administration of one nitriloside (amygdalin) has been reported as resulting in the elimination of traces of the unchanged nitriloside in the urine. Sorghum and other plants involved in cyanogenesis associated with the synthesis of nitriloside are known to emit a small percentage of free HCN.

In the case of nitrilosides with an acetone aglycone or an ethylmethyl-ketone aglycone, the ketone aglycones as well as the sugar moiety are probably fully metabolized to carbon dioxide and water with the HCN residue contributing to the production of thiocyanate, some of which may be eliminated from the body in the urine and faeces with the remainder persisting as part of the normal "cyanide metabolic pool".

EVIDENCE FOR BETA-GLUCOSIDASE IN ANIMAL TISSUES. Beta-glucosidase is found in especially high concentrations in the liver, spleen, kidney and intestinal mucosa in animals. Since HCN is eliminated as thiocyanate and since only nitriles split to free HCN can experience thiocyanate conversion by rhodanese in the presence of a source of sulfur, the fact that ingested nitrilosides increase the level of thiocyanate in the body fluids proves that they have been hydrolysed to free HCN. This hydrolysis is enzymatically accomplished only by a beta-glucosidase.

Nitrilosides are also hydrolysed to free HCN when injected into the peritoneal cavity of the rabbit. The fluid in this area apparently is lacking in rhodanese activity since free HCN has been observed in the peritoneal fluid of rabbits following injections of large doses of amygdalin. Extensive studies have also been published on the hydrolysis of nitrilosides to free HCN by the ruminal microflora of sheep.

EVIDENCE FOR OCCURRENCE OF RHODANESE IN VERTEBRATES. The detoxication of HCN as thiocyanate was first observed by S. Lang in 1894, and the enzymic aspects were first studied in 1933 by K. Lang who gave the name *rhodanese* to the enzyme concerned. Since thiocyanate is some hundred times or so less toxic than HCN, the rhodanese reaction is a true detoxication.

It appears that the concentration or activity of rhodanese in the tissues of animals varies directly with the normal nitriloside content of the general dietary characterizing each species. The livers of rats, rabbits and cows appear to be more active than those of monkeys, men, dogs, and cats in descending order. Rhodanese activity is as widely distributed in living forms as are the nitrilosides. Both have been found in forms as diverse as fish, squids, insects and plants. The enzyme has been isolated in crystalline form by Sorbo and a substantial literature on it has developed.

The action of rhodanese is highly specific. It is limited not merely to nitriles but only to those nitrilosides which surrender free HCN ions upon hydrolysis.

The administration of rhodanese has been found to protect experimental animals from doses of cyanide or its salts ten times or more in excess of normally lethal doses. The concentration of rhodanese in tissue is generally proportional to that of beta-glucosidase and always functionally in excess of the latter. Rhodanese may also appear in the absence of beta-glucosidase as in the case of the brain just as beta-glucosidase may appear in conjunction with cancer or trophoblast cells in the absence of rhodanese. The high sensitivity of cerebral tissue to hypoxia would tend in the course of natural selection to provide a high rhodanese activity against adventitious HCN and to exclude any enzymatic means by which the cyanide ion could be hydrolysed in this area. The rationale for the occurrence of a high beta-glucosidase concentration in the absence of rhodanese in the case of trophoblast plays in hemopoiesis, especially as it concerns the nitrilization of hydrocobalamin to active vitamin B-12 (cyanocobalamin).

Rhodanese, beta-glucosidase, nitrilosides, and thiocyanates are found throughout the phyla of the plant and animal kingdoms from bacteria to giant trees, and from protozoa to man.

THIOCYANATES IN PLANTS

Although the normally occurring nitrilosides in plants have never been known to contribute any evidence of chronic or cumulative toxicity from the nitriloside itself nor from the derivable HCN, thiocyanates occurring in plants, notably the *Cruciferae* or *Brassicae,* have been identified with goitrogenic properties among peasant populations subsisting on large quantities of such Cruciferae as cabbage, turnips, rutabaga, brussels sprouts, kohli rabi, cauliflower, etc., grown in iodine-deficient soil. Clovers among many other legumes and grasses are rich sources of nitriloside for grazing animals. Recently ewes grazing on nitriloside-rich clover growing in Australian soil deficient in iodine were reported as showing a high incidence of goitre which was identified as apparently arising from the thiocyanate derived from the clover nitriloside and metabolized in the presence of a severe iodine deficiency.

In soils carrying normal concentrations of iodine no such effects have been observed in sheep or cattle despite the fact that some of these animals may ingest as much as 300 grams of nitriloside a day through dry arrow-grass, Johnson-grass, clovers, or other fodder.

It will also be recalled that Wilder Bancroft, Professor of Physical Chemistry at Cornell University, ingested 1,000 mg. of thiocyanate a day for a period of 23 years

in the process of studying the cumulative properties of this chemical. He reported no untoward result from the experiment. To the contrary, he associated it with some suspected positive benefits that need not be considered at this time.

While prolonged excessive ingestion or development of thiocyanate in the presence of a severe iodine deficiency has apparently been associated with a goitrogenic effect in both human and animal populations, there has never been anything to suggest the possibility of any cumulative toxicity arising from the cyanide ion itself.

It is apparently impossible to develop cumulative toxicity to HCN in animals. The reason for this is that the biological experience with the cyanide ion in metabolism is almost as ancient and extensive as the biological experience with water, oxygen, nitrogen, salt, or the like. All can prove fatal to animals if administered in excessive quantities or in an improper way. As a result of an almost archetypical ignorance of or superstition towards HCN engendered by observations of the swiftness of its lethality made in days when chemistry had barely emerged as a science, a powerful cultural antipathy toward cyanide developed. Cyanide was indiscriminately and falsely classified, because of its toxic potentiality, with protoplasmic poisons utterly foreign to the biological experience of the organism. Unfortunately, this ancient misapprehension has been perpetuated among botanists, physiologists, toxicologists and even pharmacologists. And in their culturally induced fear or antipathy toward cyanide as a poison they have unwittingly foreclosed adequate attention to, and study of, the critically important factors in the physiology of plants and animals. An atmosphere of pure nitrogen or pure carbon dioxide is just as lethal as one of hydrogen cyanide. The major differences among these compounds possessing almost equal biological experience are those of concentrations and rates, and none are capable of producing chronic or cumulative toxicity. As we shall study in a subsequent section, sheep have received as much as 460 mg of HCN in the course of an hour without any evidence of acute toxicity and as much as 210 mg of HCN a day for two years without any evidence of cumulative toxicity or resistance or immunity of any kind to HCN. This biological experience qualitatively parallels that for water, salt, sodium chloride and compounds with similar biological experience.

Though in our early studies on the nitrilosides we attempted because of our then limited knowledge of their basic significance in terms of biological experience to ascertain some evidence of cumulative toxicity for them, we now agree with such students of the problem as Coop and Blakely that it is impossible for compounds that have through nutrition been a part of the biological experience of plants and animals millions of years before the appearance of man, and an inherent part of his physiology since his appearance, to produce any cumulative toxic effects. Whether we are dealing with the first nitriloside to be discovered, amygdalin, or with linamarin or lotaustralin, it would seem vain to expect to find from their hydrolytic products of glucose and HCN and their aglycone of benzaldehyde or benzoic acid in the case of the first, or acetone or methylethylketone, respectively, in the case of the latter, any possibility of cumulative effect. Glucose, thiocyanate, benzoic acid, and even acetone are components normal to the metabolic pathways of the organism, which would have to be susceptible to a development of a cumulative toxicity to itself in order to sustain one of the components which comprise the organism.

If the obvious is belaboured to *reductio ad absurdum*, it is because even at this late date there are apparently some unacquainted with the fact that the hydrolysis *in vivo* of a nitriloside by one or more endogenous beta-glucosidases with the production of free HCN, detoxified as thiocyanate by the enzyme rhodanese in order to protect the organism, or sometimes left undetoxified by cells or organisms lacking

or deficient in rhodanese, comprises biological phenomena that were commonplace in organisms aeons before the advent of man who inherited such mechanisms. As a result of a deficient rhodanese mechanism some organisms have been destroyed by the HCN emitted by other organisms rich in beta-glucosidase and rhodanese.

Blum & Woodring (*Science*, 138:513, 1962) in a paper on "Secretion of Benzaldehyde and Hydrogen Cyanide by the Millipede *Pachydesmus crassicutis*" describe how this large millipede whose known distribution is limited to Louisiana and southern Mississippi protects itself against its natural prey, the imported fire ant (*Solenopsis raevissima v. richteri* Forel) by secreting a mixture of benzaldehyde and hydrogen cyanide against the predator when disturbed by it. The millipede is equipped with paired glands located on eleven of the notal projections; from these glands benzaldehyde and HCN are ejected. The water-clear secretion of *Pachydesmus* was collected by touching the dorsal surfaces of the notal projections with a small square of filter paper which rapidly absorbed the liquid discharge. This discharge was then analysed by gas chromatography and infra red photospectroscopy. The major component was found to be benzaldehyde. HCN and glucose were also found together with a disaccharide which appears to be the sugar moiety of the nitroloside amygdalin. The millipede secretes it own beta-glucosidase which hydrolyses the nitriloside in the notal glands to free HCN, benzaldehyde and sugar. While the millipede protects itself from the HCN through its endogenous rhodanese, this HCN is emitted against a predator relatively deficient in rhodanese.

David A. Jones, Department of Genetics, and John Parsons, Department of Pharmacology, Oxford University, in a paper on "Release of Hydrocyanic Acid from Crushed Tissues in All Stages of the Life-Cycle of Species of the Zygaeninae (Lepidoptera)," *Nature*, 193 (4810), p.52 (1962), reported that 50 crushed eggs (weight of about 50 eggs 2.6 mg - 4.0 mg) of this moth release up to 150 micrograms of HCN, which HCN thus accounts for about 5 per cent of the weight of such eggs.

The foregoing examples were selected from a comprehensive body of similar data for the purpose of adumbrating the ubiquity of the biological occurrence and experience among all forms of life not only in terms of nitriloside but also in terms of beta glucosidase, rhodanese, thiocyanate, and the selective susceptibility of rhodanese-deficient cells to the noxious effect of adventitious HCN. Some of the data briefly reviewed in the two papers just cited concern the occurrence of rhodanese in the parasites of the gastro-intestinal tract of animals ingesting nitriloside-rich foods. Such rhodanese is, of course, necessary as a protection against the free HCN released from the ingested nitrilosides by the beta-glucosidase produced by the intestinal flora and possibly also by the intestinal mucosa of the host.

NUTRITIONAL IMPLICATIONS

Tribes in the Karakorums of West Pakistan, the aboriginal Eskimaux, tribes of South Africa and South America living on native foods, the North American Indian in his native state, the Australian aborigines, and other native or so-called primitive peoples rely upon a diet carrying as much as 250 to 3,000 mg of nitriloside in a daily ration. All populations living close to a Neolithic level appear to be characterized dietarily by a similarly high consumption of nitriloside-rich foods.

Civilized, Westernized or Europeanized man, on the other hand, relies on a diet that probably provides an average of less than 2 mg of nitriloside a day.

It is noteworthy that no case of cancer has ever been reported among the peoples

of one tribe in the Karakorums over a period of about 60 years of medical observation. For a period of at least 80 years the Eskimaux have been observed with even greater scrutiny by medical men, missionaries, teachers, traders and others for the specific purpose of attempting, to discover the possible incidence of cancer among them. Despite such observations, no case of cancer has yet been reported among these two native populations while they lived on their native diet; however, in the case of the Eskimaux a number of cancer victims have been found among those who left their original dietary habits for a Westernized diet.

The medical scrutiny by which such cancer cases were noted was no less intense than that given a large proportion of the natives not having access to modern foods.

The observations made of the Eskimaux on this subject are recorded in Vilhjalmur Stefansson's book on "CANCER: Disease of Civilization? An Anthropological and Historical Study" (Hill & Wang, N.Y. 1960). Philip R. White, M.D., has written an interesting preface to the book while Rene Dubos' introductory chapter is most instructive.

The remarkable freedom primitive populations show to dental caries is, of course, a commonplace to students of anthropology. Many of the nutritional reasons for such freedom from caries among these people are not difficult to find in terms of the food that they eat, and especially of the food that they do not eat. In the similar freedom of these populations from cancer the possible role of nutrition has been at best vague and general—as it was in the case of pellagra and the anemias prior to the discovery of the specific factor involved in the deficiency.

Major General Sir Robert McCarrison, before and during his appointment as Director of Nutrition Research in India under the Research Fund Association, treated and studied the people of Karakorum. From the perspective of 20 years of observation he reported that he had failed to find a single case of cancer among this population. Later John Clark, M.D. served in a medical mission to this population. He was properly critical of the tendency of some to romanticize the allegedly perfect health of these long-lived people. He described, as had McCarrison, a relatively high incidence of goiter among these people as well as certain skin diseases and a substantial incidence of dental caries. The nutritional basis for the high incidence of goiter among them is clear in the relative iodine deficiency of their diet, their incidence of dental caries likewise has a clear nutritional basis. The tendency to goiter though resting on an iodine deficiency is exacerbated by the presence in their diet of an abundant quantity of nitriloside, which contributes a corresponding quantity of thiocyanate that in the absence of adequate iodine is goitrogenic, as we have seen in the case of human populations eating vegetables of the thiocyanate-rich Cruciferae grown in areas deficient in iodine or in the case of ewes grazing on nitriloside-rich (i.e., thiocyanate-producing) clover grown in iodine deficient soil.

At any rate, John Clark while recognizing and describing the many pathological conditions to which these people, like all others, are subject did add that he, too, had never observed a single case of cancer among them.

While cancer may elude diagnosis in some cases, early cases ultimately become terminal cases, and when the latter involve the skin, breast, the lymphatic glands, mouth, tongue, lungs, or rectum they do not go unrecognized even by the medically naive—certainly not by medical observers.

DIETARY SOURCES FOR NITRILOSIDES

KARAKORUM TRIBE. A number of reliable works have reported the general diet of people of the Karakorum. Buckwheat, peas, broad beans, lucerne, turnips,

lettuce, sprouting pulse or gram, apricots with their seeds, cherries and cherry seeds, berries of various sorts—these are among the seemingly commonplace foods that comprise the bulk of the diet of these people. With the exception of lettuce and turnips, each of these plants contains some nitriloside. Turnips contain thiocyanate, a substance to which nitrilosides give rise.

Over a dozen books and articles that we have read on these people are unanimous in the report that the apricot is the major staple in their diet. In view of our work of the nitrilosides in relation to human cancer, the predominance of the apricot in the nutrition of these reportedly cancer-free people was frequently called to our attention over the years. We originally dismissed the matter on the basis of pure coincidence, especially since the meat or flesh of the apricot contains little or no nitriloside, which is concentrated in the seed that resides in the pit. The seed is the size of a small almond and may be mistaken for a shelled almond.

Finally, upon investigating the diet of these people we found that the seed of the apricot was prized as a delicacy and that every part of the apricot was utilized. We found that the major source of fats used for cooking was the apricot seed, and that the apricot oil was so produced as inadvertently to admit a fair concentration of nitriloside or traces of cyanide into it. The apricot seed is so prized among these people that there are experts chosen among them for the purpose of testing the seeds of new apricot trees for their bitterness, since occasionally there appear strains that produce apricot seeds carrying extraordinary and toxic concentrations of nitriloside and beta-glucosidase. These trees are destroyed.

The peoples of the Karakorum share with most western scientists an ignorance of the chemistry, toxicology and physiology of the nitrilosides and nitriles. Empirically, however, they have apparently discovered the value of these factors to nutrition, though recognizing the very toxic potential of the cyanide of apricot kernels when improperly used. They prepare a solution of HCN (prussic acid) by allowing the apricot kernel nitriloside to react, in the presence of a little water added to defatted meal, with the endogenous beta-glucosidase (emulsin) to release free HCN. The resulting solution of HCN is then maintained as a form of bitters that is added drop-wise immediately before they are drunk. It is held that this solution is contributory to health and even longevity.

THE ESKIMAUX. The diet of the Karakorum is of necessity essentially a vegetable diet; that of the Eskimaux is essentially a meat diet. Superficially no two diets could probably appear more divergent; yet the Eskimaux shares with many other primitive peoples, most of whom are dominantly vegetarian, a remarkable freedom from malignant disease. On this basis we were at first inclined to dismiss the high concentration of nitrilosides in the diet of Karakorum people and others relying mainly on plant foods as simply another coincidence, contradicted by the situation among the meat-eating Eskimaux.

Upon further investigation of the Eskimau diet we found that one berry grew abundantly in the Arctic areas and that this berry is extraordinarily rich in nitriloside. This is the salmon-berry, cloud-berry, or buffalo-berry *(Rubus spectabilis)*. It is eaten by birds, animals and men. It is also incorporated into pemmican, which is eaten during all seasons of the year. It was noted also that animals such as the caribou are important in the diet of these people. In eating the caribou the frozen contents of the rumen or paunch are utilized as a salad and considered a delicacy. In view of this we investigated the forage upon which the caribou feeds. Among the grasses that grow in Arctic marshes, arrow-grass *(Triglochin maritima)* is very common. Studies made by the United States Department of Agriculture on

the nitriloside content of arrow-grass (Triglochin maritima) show it to be probably richer in nitrilosides than any common grass. On a dry weight basis, one kilogram of arrow-grass was found to contain over 30,000 milligrams of nitriloside. One teaspoonful of such rumenal salad might be expected to carry 100 mg or more of nitriloside. This nitriloside is p-hydroxymandelonitrile-beta-glucoside; whereas the dominant one among the Karakorum is l-mandelonitrile-beta-diglucoside, though both nitrilosides occur in the diet of both groups.

A quick glance at native populations in tropical areas, such as South America and South Africa, discloses a great abundance of nitriloside-containing foods. Over one-third of all plants in these areas contain nitrilosides. Cassava or manioc, sometimes described as "the bread of the tropic", is one of the most common as well as richest sources of nitriloside. As eaten by primitive populations, the bitter and nitriloside-rich manioc is preferred. People in the cities on Westernized diet favor the sweet cassava. Even in the case of these the cassava is so processed as to eliminate virtually all nitriloside or nitrile ions. The cassava eaten by those still near a Stone Age culture, on the other hand, retains a large quantity of nitriloside and nitrile ions. When these primitive and relatively cancer-free people move to the cities, the incidence of cancer among them rises as they assume the nitriloside-free Westernized diet. Like the rest of civilized mankind, they then show a cancer incidence of one in every three or four individuals if they live for a sufficiently long period.

RELATIVE FREEDOM OF SHEEP, GOATS, AND WILD HERBIVORES FROM CANCER

The relative freedom of wild and most domestic herbivores from cancer as contrasted to its higher incidence among at least domesticated carnivores has been the subject of considerable attention. The nitriloside content of much pasturage, fodder and silage is, of course, often striking. White clover *(Trifolium repens)*, alfalfa or lucerne *(Medicago sativa)*, vetch, certain millets, Johnson-grass, Sudan-grass, arrow-grass, the various sorghums, lupines, broad beans, velvet grass, and at least 80 other grasses, the leaves of Rosacae, berries, etc.—all are common and often rich sources of nitrilosides. The two most common of the pasture grasses, Johnson and Sudan, in many parts of the United States carry as much as 15 to 20,000 mgs nitrilosides per kilogram of dry grass. A 10-kilogram ration a day is not uncommon for freely grazing animals. Such a ration would supply from 150 to 200 grams of nitriloside a day, which would upon hydrolysis yield over 10,000 mg of free hydrogen cyanide. As studies on fistulated sheep have proved, over 95 per cent of all nitrilosides ingested by herbivores in plant foods are hydrolysed within about an hour with the release of the free HCN into the organism.

Domesticated horses, however, may be deprived of a variety of plant foods and be limited more or less to fodder completely deficient in nitriloside. In such animals the incidence of cancer appears to be reasonably high, though no formal statistics are obviously available.

WILD CARNIVORES. Carnivorous animals in their natural state treat animal food similarly to the Eskimaux of a Stone Age culture. Such animals eat the viscera, especially the rumen, and often do so before eating the muscle tissue of the animal. When carnivorous animals are domesticated as pets or maintained in zoological gardens they often show a relatively high incidence of cancer. For example, in the great San Diego Zoo 5 bears have died in one grotto in the last 6 years. All have died from cancer of the liver. These bears were maintained on a diet almost completely free from nitrilosides. Many speculations were advanced as to the cause of

their malignancy, all explanations or suggestions sharing in common a version of the virus theory of cancer. These speculations are reminiscent of those made by Sir William Osler in 1906 on the etiology of pellagra as he studied a report of about 20 per cent of the population of an asylum for the colored insane dying from pellagra during one winter. To Osler this was almost conclusive evidence for the infectious or viral or bacterial origin of pellagra.

The liver cancer which killed the captive bears in San Diego is suggestive of the liver cancer which kills 95 per cent of all Bantus who die from cancer in the hospitals of one area of South Africa. In their native state, liver cancer is virtually unknown among these people. When they migrate to urban areas or to the mines their diet is changed to one consisting, for economic reasons, almost exclusively of low-grade carbohydrates completely devoid of nitrilosides. A staple of this diet is fermented milk and corn meal in a mixture known as mealie meal. When this ration was fed for a prolonged period to rats, most of the rats developed cirrhosis of the liver and the pre-cancerous changes observed in the male Bantus.

Bears in the wild state eat nitriloside-rich berries, such as choke berries, salmon berries; grasses also rich in this factor; wild fruits—apricots, peaches, apples, cherries, plums—the seeds of which are all rich in nitriloside with often the leaves and roots carrying a high concentration of the factor; and barks, roots, twigs, and flowering plants rich in nitriloside. Since bears are omnivores, they also eat game. Peter Krott, Ph.D., in his "Bears in the Family" (E. P. Dutton & Co., N.Y., 1962), describes the predatory habits of the bear as follows:

> Isolated footmarks showed the shepherds where to go and it was not long before they found the remains of the sheep in the undergrowth. The body was carefully cleaned out—a butcher could not have done better. While we roasted a leg of mutton I asked the men why they did not leave the carcass in place, as the bear would surely return to finish it.

The significance of the rumenal contents of sheep in terms of nitrilosides and nitriles will become increasingly clear in the next section. The nutritional pattern in civilized man as well as in omnivores in captivity is reversed from what obtains in nature: the viscera is largely discarded and that which animals in the wild state treat as second rate is utilized to the exclusion of a rich source of nitrilosides.

Krott also reported the fondness of bears for whole cherries. He describes feeding two bear cubs 20 pounds of cherries. Like all the non-human primates and most primitive men, the bears eat the seeds as well as the meat of cherries.

Cancer is generally considered a chronic disease. So far no chronic or metabolic disease has ever found prophylactic or therapeutic resolution except through normally occurring accessory food factors. Certainly none has ever been known to have a viral or bacterial etiology. Pellagra, scurvy, beriberi, rickets, the anemias, a wide range of neuropathies, etc., etc.—all have found total prophylactic and therapeutic resolution only in factors accessory to normal food. No chronic or metabolic disease has found any other resolution. It is not probable that cancer will prove the first exception.

SYSTEMATIC STUDIES OF THE NITRILOSIDE CONTENT OF VEGETABLE FOODS

It is not practicable to attempt to list here concentrations of nitrilosides in the vegetable foods of man and all the animals. This listing is provided in our book

together with a number of specimen diets or rations from the people of the Karakorum and elsewhere who live on a nitriloside-rich diet and these diets are contrasted with the inadvertently nitriloside-free diets or rations advanced by some modern nutritionists as ideal examples of the balanced diet.

Botanists, like agricultural and other experts, share our cultural antipathy toward cyanide. As a result of this antipathy relatively slight attention has been paid the nitriloside-containing plants, and what has been paid has been largely negative. The standard botanical technique in identifying such plants has involved a qualitative test utilizing a test tube containing a piece of filter paper moistened with a picrate solution. The suspect plant is crushed between the fingers of the botanist and then placed in the tube. A color change in the picrate paper indicates the presence of "prussic acid". In order for this color change to occur it is necessary, of course, that the plant contains not only the nitriloside but also the beta-glucosidase necessary to hydrolyse it. Many plants contain a relatively large concentration of nitriloside with little or no beta-glucosidase while other plants may contain only the enzyme without the nitriloside. The sweet almond is a classical example of the latter.

Agricultural experts have concerned themselves with the nitrilosides only when these have appeared in fodder and other plants in association with such high concentrations of beta-glucosidase that the plant upon being crushed immediately releases large quantities of HCN and thereby offers a threat to cattle. Such plants are labeled as "poisonous" by botanists and agricultural experts alike, and plant geneticists direct their efforts toward breeding "the cyanide" out of the plant. This, incidentally, is probably what occurred in the case of the sweet almond which, different from the bitter almond, carries only the beta-glucosidase and not the nitriloside (amygdalin).

The grasses and clovers have been virtually ignored so far as their nitriloside or nitrile content is concerned, since they seldom carry sufficient of the associated enzyme to present a toxic threat to food animals. In Australia, however, a wild fuchsia is often found in areas containing grasses very rich in the nitrilosides. The wild fuchsia is relatively low in nitriloside but rich in beta-glucosidase. Occasionally sheep or cattle grazing upon the nitriloside rich grasses will turn to such fuschsia plants while they are in bloom and ingest the beta-glucosidase-rich foliage. As a result of this, hydrolysis of the grass nitriloside has been so accelerated that HCN has been released at a rate beyond that of the capacity of the animal to detoxify it as thiocyanate and death has quickly ensued. This situation in Australia brought about the excellent studies by Coop and Blakely of New Zealand on the physiology of nitrilosides and nitriles through the use of sheep with artificially fistulated rumen.

METABOLISM AND TOXICITY OF CYANIDE AND NITRILOSIDES IN SHEEP

Coop and Blakely (*New Zealand Journal of Science and Technology*, 31 February 1949, page 277; *Ibid.*, 31: (3) 1; *Ibid.*, February 1950, page 45) prepared sheep with permanent rumen fistulas for the study of the production of HCN from nitrilosides and nitriloside-containing plants in the rumen. They found:

(1) When HCN is introduced into the rumen absorption is very rapid. On the average 75 per cent of the administered HCN is absorbed within 15 minutes.

(2) Hydrolysis of nitrilosides and nitriloside-containing plants in the rumen is rapid and may be completed within 15 minutes.

(3) Naturally occurring beta-glucosidase is not required because the ruminal bacteria supply this enzyme.

The ruminal bacteria supply under self-regulating conditions a source of beta-glucosidase sufficient to bring about the complete hydrolysis of nitrilosides in the ingested plant material. Regardless of the concentration of nitrilosides in the ingested plants, no toxic level of HCN is achieved because of the "self-regulating" condition under which hydrolysis is produced. Only if the nitriloside-rich vegetation is accompanied by other plant material extremely rich in beta-glucosidase is the release of HCN brought about at *a toxic rate*. Toxicity can not occur if the rate of beta-glucosidase hydrolysis is maintained at a slightly lower rate than that of rhodanese detoxication of HCN in the presence of available sulfur.

The presence of H_2S in the rumen of sheep and its rapid absorption suggest that it is probably the most important sulfur donor for HCN conversion to thiocyanate by rhodanese. While some of this conversion occurs in the rumen, probably through ruminal bacteria producing rhodanese, most of it occurs in the tissues of the animal.

Over 50 per cent of the HCN released by nitrilosides in the rumen was accounted for by thiocyanate recovered from the urine. A small quantity of free HCN is excreted by the lungs, a quantity that does not exceed 10 per cent of that produced. Additional cyanide is lost through the thiocyanates of the saliva, tears, and faeces.

For all practical purposes the release of free HCN occurred at almost the same rate for nitrilosides residing in ingested plants as it did for the corresponding nitrilosides administered in the pure form.

QUANTITY OF HCN DETOXIFIED BY SHEEP

Franklin and Reid (*Aust. Vet. J.*, 100:92, 1944) showed that normal sheep could consume the equivalent of 8 to 10 mg of HCN/kg per day as linseed meal (containing the nitriloside linamarin) without mortality. In a 70-kg sheep this would be equivalent to about 700 mg of HCN. The authors found that the only way enough HCN could be administered through plant food to produce a fatal effect was to force feed the animals.

Fistulated sheep weighing 66 kg were given over a period of three hours a dose of 2.7 grams of nitriloside yielding 300 mg HCN. Coop and Blakely reported that "at no time during the experiment were even the slightest symptoms observed". A total of 568 mg HCN was given a 76 kg sheep in the course of an hour. The only symptoms the animal showed was "a general sleepiness for an hour".

"What Is the 'Toxic Dose' of Nitriloside or HCN?"

The toxicity of nitrilosides or the CN ion is obviously not absolute but relative to two factors:

(1) The rate of hydrolysis and the rate of absorption of the CN ions by the organism.

(2) The rate of detoxication of the CN ion by rhodanese, in the presence of utilizable sulfur, to thiocyanate.

So long as rate (2) continues in excess of that of rate (1), toxicity from cyanide or the nitrile aspect of the nitrilosides is apparently not possible. "Though some authors", Coop and Blakely write,

> believe that chronic cyanide poisoning is possible, it is generally recognized that provided free HCN or cyanogenetic plants are ingested at a moderate rate throughout the course of the day animals can tolerate amounts well in excess

of the M.L.D. for a single dose. Van der Walt (Onderspoort J., 19:79, 1944) failed to produce chronic poisoning in sheep even after administering 3.2 mg HCN/kg daily for two years. Worden (*Vet. Records*, 52: 857, 1940) showed that in rabbits repeated dosing does not produce a cumulative effect and that the animal is capable of eliminating ½ M.L.D. in 2½ hours.

On the other hand, there is no evidence that continued sublethal dosing or ingestion causes any resistance or acclimatization of HCN poisoning.

In the 70-kg sheep the dose of HCN that van der Walt gave was 214 mg a day. This was repeated every day for two years so that the animal received a total of about 150 grams or ⅓ of a pound. No suggestion of any toxicity was found during this period and no trace of cumulative toxicity was found after two years.

To obtain the equivalent amount of nitriloside represented by the HCN, multiply the amount of HCN by the applicable nitriloside factor. For amygdalin this would be 16.92; for dhurrin, 11.51; linamarin, 9.11; lotaustralin, 9.66. In addition to the free HCN component, these nitrilosides yield glucose and as an aglycone either benzoic acid or acetone, all of which are either normal foods or normal metabolites devoid of toxicity. They account for the fact that, like free HCN itself, the nitrilosides are devoid of any chronic or cumulatively toxic properties.

Brown, Wood and Smith in a paper on "Sodium Cyanide as a Cancer Chemotherapeutic Agent . . . Laboratory and Clinical Studies" (*Am. J. Obst. & Gynec.*, 80: 907, 1960) observed a similar freedom of cyanide from cumulative toxicity both in mice and human patients:

> The recovery and convalescence of these patients treated with sodium cyanide was indistinguishable from that of patients who had not received cyanide. *There was no observable delayed clinical toxicity.* All patients recovered promptly from the cyanide treatment and no latent or residual effects could be noted [emphasis, ours].

Though Brown, et al. reported evidence of therapeutic effects in terms of life-extension, reduction in tumefaction, loss of pain, etc. in laboratory animals, in dogs, and in man, they were limited strictly by the safe peak level of 0.8 to 1.5 mg/kg of cyanide ion that can be safely presented at one time to animal tissue. Were the cyanide ion administered in such a way that a level of 0.8 mg/kg of free HCN might be approached but never exceeded—through the action of self-limiting enzyme systems on a stable source of free HCN—the period of exposure to the cyanide ion could have extended indefinitely instead of being limited to a few minutes as a result of rhodanese detoxification of CN ions not immediately replaced by other CN ions. While a 70 kg sheep was observed to be capable of receiving 506 mg of HCN over a period of four and a half hours without any suggestion of acute or chronic toxicity, a smaller dose of cyanide ion given very rapidly in a way to overwhelm the capacity of the rhodanese detoxifying system would have proved fatal. In another instance a sheep absorbed 360 mg HCN within 75 minutes whilst showing only minor symptoms. This would indicate that the capacity of the animal for HCN detoxification was about 300 mg per hour so that the sheep absorbing 506 mg of HCN within four and a half hours without any sign of toxicity fell well within the rate limits for the rhodanese system.

That parenterally administered nitrilosides are likewise subject to the self-limiting and protective capacities of the beta-glucosidase and rhodanese systems in the me-

tabolism of free HCN is evident from numerous studies reporting the absence of parenteral toxicity for the nitriloside amygdalin. In studies conducted by our group the LD_{50} for this nitriloside in rats was found to be 4.5 G./Kg. This toxicity apparently reflects that of the whole molecule rather than that of the CN component. Such a dose would be equivalent to 315 G. of the nitriloside (intravenously administered) in a 70 Kg subject. This "toxicity" compares favorably with that of dextrose.

The fact that HCN is a substance with fundamental physiological significance to plant and animal organisms is indicated not only by the normal occurrence of the ion in such organisms but also by the fact that, different from such true or foreign toxins as carbon monoxide, HCN does not combine with hemoglobin unless it is first reduced to methemglobin) and even under conditions in which HCN combines with such molecules as cytochrome oxidase this combination is highly reversible as evidenced by the fact that experimental animals even when unconscious from cyanide toxicity may be restored to consciousness (without any residual toxicity) through the administration of large quantities of rhodanese and other factors involved in the normal thiocyanate detoxification of this ion.

These facts serve to explain how cattle grazing on dry arrow-grass that may run 40,000 mg HCN per kilogram may during a 24 hour period ingest about 10 kilograms and safely metabolize over 400 grams of nitriloside (about a pound) in this period which produces about 40 grams of free HCN.

Given an adequate dietary source of iodine, there is no evidence suggesting that even a goitrogenic excess of thiocyanate would develop in cattle consuming grasses as rich in nitriloside as arrow-grass. Johnson-grass and Sudan-grass are among the most common fodder grasses and a nitriloside content equal to 75 per cent that of Arrow-grass is not uncommonly found among them. That the thiocyanate produced from them presents no problem is further suggested in the fact that Professor Wilder Bancroft of Cornell ingested 1,000 mg of thiocyanate a day for 23 years and lived to the age of 88 without any sign of cumulative toxicity from the chemical. Such an amount of thiocyanate would represent the detoxification of about 450 mg of HCN a day which would be equivalent to the quantity of HCN released from the *in vivo* hydrolysis of 7,650 mg of the amygdalin nitriloside a day. The dextrose released from such a quantity of the nitriloside would not be sufficient to raise the dextrose level from a normal 120 mg per cent in the blood to 121 mg per cent. The benzoic acid released would be equivalent to a little over a gram, which is about the quantity of benzoic acid produced through a moderate ration of certain plant foods.

It is not practicable to attempt to review here the great number of papers published during the past 164 years since L N Vauquelin first reported the identification of HCN in apricot seeds in his paper—"Expériences qui démontrent la présence de l'acide prussique tout formé dans quelque substances végétales" (*Ann. Chim.*, 45:206, 1800).

From the appearance of Vauquelin's first paper in 1800 to the present no one in the course of hundreds of papers on the subject has advanced any experimental evidence suggesting the possible cumulative toxicity of the nitrilosides such as amygdalin. Authoritative works over the world, including many editions of the *United States Dispensatory*, have properly described amygdalin as non-toxic when parenterally administered and devoid of cumulative toxicity. Certain populations have ingested in their foods up to a gram of this nitriloside a day for spans in excess of 50 years; yet such is the cultural antipathy toward the cyanides, and the misunderstanding of them therefrom resulting, that some authoritative groups have urged that the nitriloside amygdalin be studied for a period of three or four months for its

possible cumulative toxicity when administered to rabbits parenterally in doses of 15 mg kg body weight. This is despite the fact that these animals may already be ingesting plant material carrying a nitriloside content well in excess of the suggested parenteral levels. Davison ("Synopsis of Materia Medica, Toxicology and Pharmacology", 3rd Edition, C. V. Mosby, St. Louis, 1944, p. 33) expresses the unanimous opinion of informed authority in stating: "The glucoside amygdalin, given by injection, produces no harmful effect".

Such common foods as lima beans may contain over a gram of nitriloside to the pound.

IN WHAT CLASSIFICATION DO THE NITRILOSIDES FALL?

We have seen that cattle may metabolize almost a pound of nitriloside a day through their fodder, and continue to ingest large rations of nitriloside throughout the span of their life. Indeed, the better the fodder the more nitriloside it is likely to contain.

Can the water-soluble non-toxic nitrilosides properly be described as food? Probably not in the strict sense of the word. They are certainly not drugs per se. They are non-toxic, and they do contribute the essential nitrile radicals to what students of physiology describe now as the "metabolic cyanide pool" in the animal organism. They foster the production of thiocyanate, are involved in the nitrilization of hydrocobalamin to active vitamin B-12 or cyanacobalamin, and they exert a physiological effect that when sufficient is reflected in a hypotensive reaction. They do not depress any vital function such as hemopoiesis. To the contrary, their CN ion has been repeatedly reported as raising both the red cell count and the total hemoglobin in animals and humans given small quantities of cyanides or various quantities of the nitrilosides.

Since the nitrilosides are neither food nor drug, they may be considered as accessory food factors. *Another term for water-soluble non-toxic accessory food factors is vitamin.*

THERAPEUTIC IMPLICATIONS

We have glanced briefly at populations almost or entirely free from cancer under dietary conditions native to them. One such population was seen to be almost exclusively vegetarian; the other, almost exclusively meat-eating. These populations shared in common a high consumption of nitrilosides. We live in a civilization in which one out of every 3 or 4 of us will develop cancer. Our population is characterized by a dietary pattern almost devoid of nitrilosides.

We have seen animals that in their native state are almost devoid of cancer. Observing these animals in captivity we see an alarming increase in the incidence of cancer in them. These animals whether they be the 5 bears in the San Diego Zoo that died from cancer over the past six years or cats and dogs in our household share one common dietary experience: an almost total deficiency in nitrilosides in contrast to the abundance of this factor in their natural diet. To these generalizations on the increased incidence of cancer in domestic animals we find a remarkable exception in sheep and cattle. But when we examine their ration we find it extremely rich as a rule in the nitrilosides. An exception sometimes is found to this in work horses. Here we find the incidence of cancer strangely elevated. Such animals are usually maintained on a nitriloside-free ration of oats and timothy hay and the like.

We frequently observe cats and dogs that under domestication are provided with

a variety of rich foods seek out a garden or a weed patch and commence to eat Johnson-grass, even certain species of crab-grass, and other grasses. These grasses have in common a high nitriloside content. In the wild state we see even the omnivorous bear eat first the nitriloside and nitrile filled rumen of sheep while leaving the mutton legs and the remainder of the carcass for a period of hunger.

Among the poor of rural Turkey the incidence of cancer is substantially lower than in the West. Professor Sayre in the May 1960 issue of the *New England Journal of Medicine, 270* published a paper on "Health Hazards, Cyanide Poisoning from Apricot Seeds Among Children in Central Turkey". The children involved had mistaken the wild apricot for the domestic variety. The wild variety carries seeds containing 2,000 mg of HCN per Kg, equivalent to about 35 grams of the nitriloside. The nitriloside existing in the presence of a rich concentration of beta-glucosidase in these seeds renders them toxic. But adults and children in Central Turkey prize these seeds as a delicacy, and parents believing they are "good for the health" do not dissuade their children from eating them.

In the June 1964 issue of *Gourmet Magazine* there appeared a letter that since China does not have a true almond the nut of the apricot is used in its place. This letter caused a physician's wife to write in alarm warning the Editor against the food use of apricot kernels. The Editor for a time shared her alarm until he consulted with the U. S. Food and Drug Administration, the Poison Control Center of New York City Department of Public Health, and others. The consensus was that the seeds were safe for human consumption because the quantities used are usually small and cooking provides an additional safeguard (through destroying the beta-glucosidase).

All this is despite the fact that all the subhuman primates that eat apricots, plums, cherries, peaches, apples, and the like also eat the seeds. All the primates fed these fruits in zoos are seen tediously to extract and eat the seeds from pits as resistant even as the apricot. All people of the Stone Age culture, so far as we have been able to ascertain, eat the seeds of all fruits—almost all of which are extremely rich in nitrilosides.

ORIGINAL STUDIES

Over a decade ago clinical investigation of then empirical extracts from apricot kernels *(Prunus armeniaca)* was commenced because of evidence of some anti-neoplastic activity in animals. In humans this extract proved to be palliative in human cancer. Further study showed the responsible factor to be the nitriloside amygdalin. This nitriloside (Laetrile) was then chosen as the subject for systematic clinical investigation after its lack of immediate or cumulative toxicity was demonstrated on experimental animals.

The doses of the nitriloside standardized for human use range from about 12.5 mg/kg to 37.5 mg/kg of the nitriloside. These doses supply from 0.8 mg/kg of the HCN ion. Doses as high as 20 grams or more intravenously have been shown to be without toxic effect in healthy human subjects, though a mildly hypotensive effect is produced through the thiocyanate engendered by such large doses. It appears that the 0.8 mg/kg (equivalent to a dose of 1.0 gram of the nitriloside in a 70 kg patient) is generally optimal.

Brown, Wood and Smith in their studies on sodium cyanide in mice bearing Sarcoma 180 found experimentally that 0.8 mg/kg of the CN ion was the optimal dose in contributing a life-extension of as high as 70 per cent to not only these mice but to another strain bearing Ehrlich's ascites cell tumors. Not only did such doses lack

cumulative toxicity; but the controls not receiving the cyanide obviously experienced a 70 per cent shorter life-span.

Brown et al. were unaware of any work on nitriloside during the period they made their studies; yet the optimal dosage of the nitrile ion they arrived at from studies on cancer animals is identical to the optimal dose determined for clinical use for nitriloside (Laetrile) by many clinical investigators working over the course of a decade while gradually scaling their original doses of 50 mg of the nitriloside to the present dose of 1,000 mg and altering the route of administration from an intramuscular one to an intravenous one.

Brown et al. observed—

> Because the action of . . . cyanide is almost instantaneous and since normal tissues and cells are capable of recovering from its noxious effects, it could be anticipated here that there would be no cumulative or latent complications in the bone marrow, the gastrointestinal tract, or the renal apparatus.

Clinical experience with approximately 100,000 parenteral doses of nitriloside in man over a decade of study have sustained Brown's original findings on the non-toxicity of the CN ion administered within the capacity of the rhodanese system. Administration of the ion in the form of nitriloside, of course, provides an optimal concentration of the ion in a safe and self-limiting fashion—self-limitation being the characteristic of the action of accessory food factors.

Maxwell and Bischoff in 1933 (*J. Pharmacol. & Exper. Therap., 49:*270) in studying the possible cumulative effect of HCN in mice reported: "After twenty-one days of exposure to HCN, the red blood cell count and the hemoglobin rose in the mice 12 to 15 per cent, and in the rats, 20 to 25 per cent."

Their experience has been confirmed repeatedly by clinicians studying the action of Laetrile (nitriloside) in advanced cases of human cancer where the nitriloside-derived HCN has produced a substantial stimulation in hemopoiesis even in some terminal patients.

In 1935 Isabella Perry of the Department of Pathology, University of California Medical School, reported on the study of "The Effects of Prolonged Cyanide Treatment on the Body and Tumor Growth in Rate" (*American Journal of Cancer, 25:*592). Reporting the action of prolonged inhalation of cyanide fumes in young tumor-bearing rats, she wrote:

> . . Retards the growth of Jensen sarcoma implants. A considerable percentage of the animals so treated showed complete regression of the tumor. Both regressing and growing tumors in treated animals had little capacity for transplantation. . . . The dose was given on strips of blotter paper. . . . It seems that the range of the effective dose is limited and too close to the lethal dose to be practical.

The administration of the CN ion through non-toxic nitrilosides eliminates the limitation. Perry observed that

> In the treated animals the tumors grew slowly and necrosed early. Ten days after the inoculation the tumors in 9 treated rats averaged 0.5 cm in diameter, while the 8 control rats had tumors averaging 2.2 cm in diameter. On the twenty-fifth day after the tumors had been inoculated and fifteen days after the

cyanide treatment was discontinued, 5 treated survivors had tumors averaging 2.5 cm in diameter while the tumors in the control animals averaged 8 cm in diameter.

Of the control rats bearing Jensen sarcoma 8 had died and only one was surviving on the 34th day after inoculation. By the 105th day 6 treated rats that had received the same implantation were still alive and showed extensive tumor regression. Such residues which remained were untransplantable. Thus treated by the inhalation of HCN gas, with all its attendant dangers, rats bearing Jensen sarcoma transplanted often showed not only complete tumor regression but an average life extension in excess of 300 per cent.

These observations have been substantiated clinically with the nitriloside-derived CN ion of Laetrile and without any evidence of toxicity and no side effect except the increase in red blood cell count and hemoglobin first observed in 1933 by Maxwell & Bischoff in mice receiving cyanide ions.

Clinical investigation of parenteral nitriloside (Laetrile) at four universities' medical schools over the past decade have confirmed the animal studies reporting a specific chemotherapeutic effect of the CN ion in cancer. Professor M. D. Navarro of the University of Santo Tomás Medical School has observed such effects for Laetrile (nitriloside) over a period of twelve years.

One gram of Laetrile (nitriloside) treated with beta-glucosidase derived from the tissues of experimental animals (with or without cancer) supplies 56 mg of HCN. This HCN may be administered through inhalation to cancer animals as in the case of Perry's studies. It may be neutralized with NaOH to form sodium cyanide and then so administered as in the case of the work by Brown et al. who found that 0.8 mg/kg of the cyanide ion provided a 70 per cent life extension in experimental animals and an apparently complete regression in spontaneous cancer in dogs as well as substantial palliation in some human cases. Under experimental conditions Laetrile (nitriloside) has been hydrolysed by a few drops of beta-glucosidase to a solution of free HCN, sugar and benzaldehyde. In this state the material, of course, becomes as toxic as the materials used by Brown et al., Perry, Maxwell & Bischoff and others, and provides the same action as such.

FOCAL ACTION OF LAETRILE (NITRILOSIDE)

Some of the findings reporting a selective action for CN on a diversity of malignant tumors in various animals have been briefly reviewed. In all these cases the administration of the CN ion was presented to the tissues of the organism diffusely and at an uniform concentration whether through injection of a cyanide salt or through inhalation. We have pointed out that by the prior hydrolysis of Laetrile (nitriloside) *in vitro*, the injection of the hydrolysed material (before and after neutralization with NaOH) or its administration through the vaporization of HCN would present the organism with precisely the same chemicals in the same quantities as in the described experiments.

When the nitriloside, however, is parenterally administered as such it enters the blood stream as an intact molecule. Malignant lesions are focally characterized by an especially high and selective concentration of beta-glucosidase and beta-glucuronidase. An extensive literature describes the high focal concentration of beta-glucuronidase that characterizes most malignant lesions. This concentration is often in excess of 300 times that of the contiguous somatic tissues. There is also a substantial literature describing the deficiency of the definitively malignant cell in

rhodanese. The occurrence of beta-glucuronidase appears to be paralleled by an equal concentration of beta-glucosidase. Both enzymes are described generically as *beta-glycosidases*. Synthetic glucuronosidic nitrilosides (Laetrile) have been synthesized to exploit the beta-glucuronidase system in the same manner in which the natural nitrilosides are used against the beta glucosidase system at the malignant lesion. In comparative studies it has been found that both the natural and synthetic nitrilosides are active against their respective enzyme systems. The simple natural nitriloside, however, has been chosen for our routine investigation at this time.

The nitriloside is selectively hydrolysed at the malignant lesion by the beta-glucosidase in the rhodanese-deficient lesion. In this way the CN ion is brought to the malignant cell in an highly concentrated and selective manner. It is true that there are a number of normal tissues in the body that carry both beta-glucosidase and beta-glucuronidase but they also carry a countervailing concentration of rhodanese, which completely protects such normal somatic tissue from the action of any cyanide ion that the beta-glucosidase or beta-glucuronidase component of the tissue causes to be released from the hydrolysed nitriloside. In each instance the rhodanese capacity in such tissues is proportional to, though in excess of, the beta-glucosidase capacity. This prevents the diffusion of the hydrolysed CN and accounts for the fact that Laetrile (nitriloside) is completely non-toxic to somatic or non-malignant tissue while being extremely and selectively toxic to the specific malignant cells that provide a situation in which nitriloside is hydrolysed at a rapid rate in the absence of an adequate rhodanese system. While the studies by Perry, Brown et al., Maxwell and Bischoff have shown in experimental animals, in domestic pets bearing spontaneous cancers, and in man that the malignant cell is selectively susceptible to cyanide ions diffusely and uniformly distributed among all body cells, the clinical work on Laetrile (nitriloside), as well as the early animal work, has shown that the selective susceptibility of the cancer cell to HCN may further be exploited through the phenomenon of selective lysis at the malignant lesion.

The equivalency of the derivable HCN of nitriloside to that of NaCN and HCN used by Brown et al. and Perry, respectively, has been stressed almost to an absurdity for the purpose of emphasizing that in non-toxic water-soluble accessory food factors normal to the adequate diet of the higher animals and man there exists a component that will bring about the total regression of a variety of cancers in experimental animals, reduce the size of other malignant lesions 8-fold or more, prevent by 10-fold or more the rate of malignant growth as compared to that seen in control animals bearing the same tumor, and render the treated tumors insusceptible to transplantation and the treated animals resistant to the implantation of cancer as compared to controls showing full transplantability as well as full receptivity to malignant transplants.

The effect of rendering the malignant tumor untransplantable and rendering the treated animal insusceptible to the transplantation of a malignant tumor are expressive of *prophylactic effects*. Like all other non-toxic water-soluble accessory food factors that have been identified as specific in a given chronic or metabolic disease, the specificity of nitriloside is also accompanied by a specific prophylactic effect.

To emphasize again the equivalency of the cyanide ion in nitriloside as compared to the free ion or its salt, we may point out that many nitriloside-rich food plants need merely be mashed in their native state and allowed to stand awhile in their own fluid to cause them to surrender the free HCN that can duplicate what has already been achieved by this ion in experimental animals bearing transplanted or spontaneous cancer. This is the non-toxic water-soluble accessory food factor that is as im-

portant to adequate nutrition as ascorbic acid, thiamine, riboflavin and similar nontoxic water-soluble accessory food factors that appear in plants in a lower concentration, as a rule, than does nitriloside.

UNIFORMITY OF EFFECT

It will be noted that the CN ion did not produce a total regression of all tumors in all animals. It brought about a total regression of a good variety of tumors in four or more species of animals. It also accounted for an average life-extension of 70 per cent in one group and extension as high as 300 per cent in another group. Of all achievements, failure is the most facile to attain. There have been several investigators who sought to prove that Laetrile (nitriloside) had no action in experimental animals bearing cancers. The longest study done involved less than six weeks and a transplanted Jensen sarcoma. The investigator failed to achieve "objective results" in this period, and discounted the soundness of the experiment on the declared grounds that animal tissue contained no means to hydrolyse nitriloside to free HCN—that animal tissue does not contain beta-glucosidase. Such incompetence of a presumably honest nature has characterized many of the mistaken notions that experimental demonstration is gradually eliminating from this area.

CLINICAL STUDIES

We have written nothing about the very extensive and very successful clinical investigation of nitriloside (Laetrile) that has been conducted by a number of highly competent workers over the world. Without exception all of these men have reported one degree of success or another in advanced or terminal cases. No one who has actually used and studied the material has failed to report positive results, though many who have neither used nor studied the material have criticized it. Such critics have described the provable positive results, and even recoveries that have followed the use of nitriloside (Laetrile) in late or terminal cancer patients as an expression of "the delayed therapeutic effects of prior radiation, surgery or other chemotherapy". Since only advanced cases in which such measures have already failed have so far been given Laetrile (nitriloside), all such cases are theoretically subject to the critical explanation described. One clinician has pointed out that if nitriloside itself does not directly produce the results that usually follow its application, it does greatly increase the percentage of "delayed therapeutic effects" that follow seemingly unsuccessful prior measures. One can but anticipate that, when the nitrilosides are finally used in the treatment of those cancers previously untreated by other methods, the incidence of spontaneous remissions will be found by such critics to have increased beyond reasonable statistical expectations.

II

THE UNITARIAN OR TROPHOBLASTIC THESIS OF CANCER*

by Ernst T. Krebs., Jr.,** Ernst T. Krebs, Sr., †
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It is veritably impossible to find, among the hundreds of valid experimental contributions to our knowledge of cancer made during the past half century, an experimentally established datum that would controvert the thesis of the basic biological uniformity characterizing all exhibitions of cancer.

THE CRITERIA OF UNIFORMITY

To the experimentalist who does not overtly accept an unitarian thesis of cancer, such a thesis is still implicit in the commonplace facts of his science. The classic experiments of Warburg on the respiratory pattern of cancers of various species and tissue origins reveal a high uniformity from tumor to tumor.[1] Correlatively, the Coris find the lactic acid and sugar content of the various exhibitions of cancer to be highly uniform.[2] Williams and his co-workers report a pronounced degree of uniformity in the concentration of eight B vitamins in a great variety of animal and human tumors, regardless of the tissue of their origin or the manner of their induction.[3] Robertson makes similar observations for vitamin C.[4] The addition of various substrates to malignant tumors of various types yields highly uniform respiratory responses.[5] Shack describes an almost complete uniformity in cytochrome oxidase content in a number of mouse tumors.[6] Greenstein finds that the presence of any exhibition of cancer uniformly results in a depression of the liver catalase.[7,8] Maver and Barrett describe substantial evidence for an immunological uniformity among malignant tumors.[9] Greenstein reports an impressive degree of uniformity in en-

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zyme concentration among malignant tissues, regardless of their means of induction, tissue of origin or species of origin.[10] Others describe a uniformly low content of such aerobic catalytic systems as cytochrome, succinic, and d-amino acid oxidases, cytochrome-c, catalase and flavin.[11,12,13,14,15,16,17]

Further phenomena of uniformity are observed in the elevated water and cholesterol content of malignant tumors as well as other primitive tissues.[18,19] The induction by a single steroid carcinogen, such as methylcholanthrene, of malignant exhibitions as diverse as leukemia and malignant melanoma, attests to a basically uniform etiology.[20] The uniformity of various exhibitions of cancer in respiratory properties, lactic acid production, vitamin content, enzyme content, action on a given substrate, effect on liver catalase, cytochrome oxidase content, immunological properties, and many other characteristics is correlative to an uniformity of malignant tumors in the ability to metastasize, in their amenability to heterotransplantability,[21,22] and in their autonomy, invasiveness and erosiveness. Indeed, there is no known basic property unique to any single exhibition of cancer—the only variation being a morphological one partially conditioned by admixed benign or somatic components.

The degree in the uniformity of the factors described increases with the increasing malignancy with which the tumor is exhibited. Thus with an increasing degree of malignancy, all malignant exhibitions converge toward a common tissue type. For this reason the cells of the most malignant of all exhibitions of cancer should epitomize the properties of the malignant component in all other exhibitions of cancer. That this is the case, we shall observe in the pages that follow.

We have glanced briefly at data that are commonplace to cancer research. The logical consequences of these data have, however, seldom been examined. Since the phenomenon of cancer is truly an unitarian one, then, of logical necessity, the variations in the biological malignancy of different exhibitions of cancer must be a function of *the concentration of a cell of an intrinsically uniform malignancy.*

POSITION OF THE CANCER CELL IN THE LIFE-CYCLE

In accounting for the nature and origin of the single cell type comprising the constant malignant component in the varying morphological exhibitions of cancer, we find one of two alternatives open. The definitively malignant cell either has its normal counterpart in the life-cycle or the malignant cell is without a normal cellular counterpart and, therefore, arises as a spontaneous generation. Since spontaneous generation is an untenable postulate, the only alternative is that the malignant cell has its counterpart in the life-cycle. The question then arises whether this counterpart is a relatively developed cell or the most primitive cell in the life-cycle. Since the primitivity of the cancer cell is a commonplace, in looking for its cellular counterpart in the life-cycle we turn to the most primitive cell in this cycle. This is the trophoblast cell. Then as a logical corollary of the unitarian thesis, we should find the trophoblast cell as the constant malignant component in all exhibitions of cancer: the malignancy of the cancer varying directly with its concentration of trophoblast cells and inversely with its concentration of somatic cells.

If the unitarian thesis is valid, then the most malignant exhibition of cancer possible should be comprised almost completely of *frank* trophoblast cells; and, in being so comprised, should epitomize the cellular and other phenomena shared by exhibitions of a lesser malignancy. The most highly malignant exhibitions of cancer known are the chorionepitheliomas comprised of frank *trophoblast cells,* cytologically, endocrinologically and otherwise indistinguishable from normal preg-

nancy trophoblast cells. If cancer is an unitarian phenomenon whose malignancy is a function of the concentration of trophoblast cells within a given tissue, then the greater the concentration of such cells within a tissue the higher the malignancy of the tissue and the more profound its cytological deviation from the cytology normal to the tissue. If the unitarian thesis is valid, then the single exception to this generalization would comprise the most malignant of all exhibitions of cancer: that involving the pathologic exhibition of the normally or "physiologically" malignant pregnancy trophoblast. It is, therefore, most significant that when pregnancy trophoblast is malignantly exhibited as primary uterine chorionepithelioma there is no *ascertainable cytological, endocrinological or other intrinsic change whatever from the normal trophoblast cell.* As Boyd has phrased it, "microscopically the chorionepithelioma is an exaggeration of the condition normally found in pregnancy."[23] All other tumors represent an attenuation of the condition of their normal tissue of origin.

PROPERTIES OF THE TROPHOBLAST CELL

But if cancer is, as an unitarian phenomenon, trophoblastic then we should expect to find occasionally in the male—where trophoblast never normally exists—at least some cases in which the failure in somatic resistance to the definitive malignant cell (trophoblast cell) is so complete that the trophoblast is frankly exhibited as such in the fiercely malignant testicular or primary extra-genital chorionepitheliomas.[24, 25, 26, 27, 28] The chorionepitheliomas are unquestionably the most malignant tumors in either sex, and the degree of their malignancy is routinely determined by measuring the gonadotrophin their trophoblast cells excrete.[29,30,31]

If the trophoblast cell, presented outside the normal canalization or checks of pregnancy, is truly the cancer cell, then it must be impossible for the trophoblast cell or its hormone—"chorionic" gonadotrophin—ever to be found in the male or, aside from the canalization of normal pregnancy, in the female except in a malignant fashion. *Neither the trophoblast cell nor its hormone has ever been so found except as cancer.* And whenever the trophoblast cell or its hormone has been found in the male or the non-pregnant female, the associated malignancy is observed to vary directly with the urinary excretion of trophoblast cell-produced gonadotrophin.

Even a superficial examination of the trophoblast cell indicates that it possesses such properties of the cancer cell as invasiveness, erosiveness, autonomy and ability to metastasize throughout the organs of the host.[32, 33] Indeed, though normally canalized to physiological ends, the pregnancy trophoblast in carrying the conceptus from anatomically outside of the maternal host to implantation within the uterine wall must behave in a profoundly malignant fashion. No malignant cell invades any tissue any more rapidly and completely than the pregnancy trophoblast does the human uterus in the first few weeks of gestation.

If the trophoblast cell, then, is *intrinsically* malignant, this malignancy should become especially apparent when the trophoblast is removed from the normal extrinsic checks and controls surrounding it in its normal canalization of pregnancy. Maximov is among those who have observed normal pregnancy trophoblast in tissue culture *pari passu* non-trophoblast.[34] He describes as follows a tissue culture preparation of a normal rabbit embryo *plus* the contiguous trophoblast:

> From the very first moment of their formation *in vitro*, the trophoblastic elements, whose function under normal conditions is to destroy, resorb, and

penetrate into the uterine mucosa, attack the growing embryonic tissues. They glide between the cells through the intercellular spaces, along blood vessels, gnaw large holes in epithelial sheets . . . Wherever they appear they dissolve, destroy and resorb everything surrounding them. The picture sometimes bears a striking resemblance to *chorionepithelioma malignum*. As *in vitro* there is no maternal tissue, the destructive tendencies of the trophoblast are directed toward the next and only available—the embryonic tissue itself. This is rapidly destroyed and totally used up for the nutrition and growth of the trophoblast.

Maximov's description of the nutritive utilization by the trophoblast of somatic or embryonic tissue *in vitro* bears a striking parallelism to the following observation of Greenstein[35] on the nutritive behavior of the cancer cell: "It is, indeed, astonishing that a tumor can thus attach itself to an organism already running downhill in negative nitrogen balance and subsequently grow at the host's further expense."

Parasitization is eloquently clear in the description given by Maximov and it is implicit in Greenstein's observation. Normal pregnancy trophoblast represents, of course, a parasitization of cells of one genetic constitution by those of another. If cancer is an unitarian and thereby a trophoblastic phenomenon, its parasitic behavior is very easy to understand.

Were pregnancy trophoblast *in vivo* or *in situ* to lack the humorally mediated checking influences that are lacking *in vitro* then such tissue would expectedly behave as it does *in vitro* and be exhibited in the fiercely malignant fashion of primary uterine chorionepithelioma.

Rather than pause here to review in further detail the points of identity between the cancer cell and the trophoblast cell, of which the senior author in a review of over 17,000 papers has been able to catalogue 43, let it suffice to say that we have been unable to find a single point of dissimilarity between the cancer cell and the trophoblast cell. The points of identity, of course, are those shared exclusively by the cancer cell and the trophoblast cell and not shared by any somatic cell.

THE CELL OF ORIGIN AND THE MEANS OF ITS DIFFERENTIATION

If cancer is a truly unitarian phenomenon, then its cellular origin as well as its cellular nature are exemplified in the origin and nature of the most malignant exhibition of cancer—primary uterine chorionepithelioma.

Pregnancy trophoblast arises through the *differentiation* by meiosis of a diploid totipotent cell in response to *organizer stimuli* (afforded through the sex steroids). The meiosis of the diploid totipotent cell results in a haploid gametogenous cell whose only alternative to death is division (sexually or parthenogenetically induced) with the consequent production of trophoblast. The only cell from which the most primitive cell in the life-cycle, the trophoblast cell, can arise is the most undifferentiated or most potent cell in the life-cycle: the diploid totipotent cell. It is this cell alone that is competent for meiosis. In fact, aside from the explanation of spontaneous generation, only two alternatives exist for the origin of the malignant cell. Like all other growth phenomena, it may arise as the result of the differentiation of an undifferentiated cell in response to organizer stimuli; alternatively, it may be ascribed to the ontogenetic "reversion" of normal cells to a primitive state. Even though the very notion of such reversion is a thermodynamic fantasy inadmissible by modern biology, if a normal cell *could* revert, the most primitive cell in the life-cycle toward which such reversion could occur is still the trophoblast cell. Hence,

aside from the errors of spontaneous generation or cellular reversion, *only the phenomena of cellular differentiation are tenable in accounting for the origin of the cancer cell—though the stimulus to such differentiation may, of course, be deliversely mediated.*

It is thus a simple embryological fact that the malignant component of the most malignant of all exhibitions of cancer—primary uterine chorionepithelioma—represents the unchecked growth of normal trophoblast that has arisen through the differentiation of a diploid totipotent cell, by reduction division, and the division of the consequent haploid gametogenous cell to produce trophoblast. We have seen the proof of this in the fiercely malignant behavior of rabbit trophoblast removed from the checking influence of the maternal host and placed in tissue culture. This trophoblast, of course, came into being through processes normal to the production of all trophoblast in normal gestation. This is true also of the trophoblast of primary uterine chorionepithelioma.

It is necessary that we emphasize here the fact that our description of the origin of *any* trophoblast cells is merely a recapitulation of commonplace, universally accepted embryological data. We must not permit terminology to obscure this fact. Let us add that it has been experimentally established that in mammals the haploid gametogenous cell in either the male or the female may be non-sexually activated into division with the consequent and inevitable production of trophoblast.

Because the trophoblast cell of primary testicular chorionepithelioma is indistinguishable from that of the normal pregnancy trophoblast cell[36, 37, 38] or a trophoblast cell of primary uterine chorionepithelioma,[39, 40] the general consensus in pathology that chorionepitheliomas arise from the division of a gametogenous cell (non-sexually activated), derived through the normal meiosis of a diploid totipoint cell, is biologically and logically sound. It is likewise generally recognized that *primary extra-genital* chorionepitheliomas occurring in both sexes represent trophoblast that shares a common cellular origin with all other trophoblast: an origin from an haploid gametogenous cell (through fertilization or non-sexually) that has arisen through the meiosis of a diploid totipotent cell. This principle is congruent with the axiom that cells which are alike arise from pre-existing cells that are alike.

INDEX OF MALIGNANCY

If cancer is an unitarian phenomenon in which all morphological exhibitions share, in varying degrees, the known malignant component of the chorionepitheliomas, then it follows (1) that the malignancy of a growth will vary directly with its concentration of trophoblast cells and inversely with its concentration of body or somatic cells; and (2) the trophoblast cells comprising a malignant lesion must possess the capacity for being morphologically masked or obscured by the tissue in which they primarily occur or to which they metastasize. Testicular chorionepitheliomas afford an interesting vantage point for the examination of these possibilities. In screening over 900 testicular cancers in the Army Institute of Pathology, Friedman and Moore (1946) reported, in part, as follows:[41]

> *Nearly twice as many metastases which exhibited chorionepitheliomatous structures arose from primary tumors containing no chorionepithelioma as from pure chorionepitheliomas or neoplasms containing focal chorionepithelioma.* While only 0.4 per cent of the primary testicular tumors were pure chorionepitheliomas and 6.4 per cent showed focal chorionepitheliomatous

tissue, *27 per cent of all metastases which terminated fatally contained chorionepitheliomatous elements.* (emphasis ours)

Thus, not only may the trophoblast, when frankly exhibited as such in the primary site, metastasize to be morphologically masked in the secondary site, but the primary trophoblast itself may be morphologically masked by the soma and be frankly exhibited only when metastases occur into tissues of relatively lower reactivity in which the trophoblast is not morphologically masked but is frankly exhibited as such. The masking of the trophoblast by the reactivity of the somatic cells is a measure of the resistance of the host: the degree to which such somatic resistance against the ectopic trophoblast fails determines the malignancy with which the trophoblast is exhibited. Thus, the greater the incidence of a chorionepitheliomatous exhibition (trophoblast) in the metastases, the greater the degree of malignancy.

COMPETENT CELL AND ORGANIZER

The origin of every new cell is the result of the apposition of a competent cell and an organizer stimulus. All new cells arise as the result of cellular differentiation, which is a process by which a new cell type of a higher degree of individualization and a lower degree of developmental competence is produced. There are no exceptions to this generalization—not even the cancer cell. While a differentiated cell may become plastically deformed or necrobiotic, it can never form a new cell type through any means except the forward-moving course of cellular differentiation. Cellular reversion is a thermodynamic impossibility; it has never occurred and can never occur. Water will not run uphill—not even in cancer. The cancer cell is neither a deformed one nor a necrobiotic one. Its lethality resides in the very fact that intrinsically it is a normal cell—though its spatial and temporal relationship to the organism-as-a-whole is an abnormal one. The trophoblastic or unitarian thesis simply recognizes that: (1) the cancer cell is contained within the life-cycle and (2) that it is the most primitive cell in that life-cycle.

Though the diploid totipotent cells which give origin to trophoblast are known to be very abundant in the gonads, the question next arises as to their occurrence extra-genitally. Most modern pathologists[42, 43, 44, 45, 46] recognize the existence of so-called ectopic germ cells (diploid totipotent cells) and Bounoure[47] has, in an extensive monograph, recently reviewed the conclusive observational and experimental evidence for the dispersion of such cells throughout the soma. Of course, embryologically, these cells are nothing more than totally undifferentiated cells that have not, as Arey phrased it,[48] participated in body building but have reserved their total potency or competency since the initial cleavage of the zygote. Cells of various degrees of undifferentiation exist within the soma as a reservoir from which tissue repair and regeneration occur. *But only the totally undifferentiated cells of the soma are competent for meiosis;* these cells are the diploid totipotent cells. Of course, all cells in the soma are diploid, but only those that are *totally undifferentiated* are totally potent or *totipotent*—hence competent for meiosis. That such cells exist as well as function in the soma is further proved by the occasional occurrence of primary extra-genital chorionepithelioma in the male in such regions of low tissue reactivity as the pineal gland[49, 50] and the anterior mediastinum.[51, 52, 53, 54] The frankly exhibited trophoblast cells are correctly attributed to the only progenitor of trophoblast: a diploid totipotent cell that has undergone reduction division of meiosis to form a haploid gametogenous cell that has trophoblast formation as the

only alternative to death.

Carcinogenesis is thus seen to be a phenomenon involving a spatially anomalous *differentiation* in response to organizer stimuli. (Primary uterine chorionepithelioma—as well as normal pregnancy trophoblast—while involving precisely the same differentiation in its origin, does not, of course, involve it anomalously.) The differentiation involves the phenomenon of meiosis with the consequent production of trophoblast, which, presented ectopically, is inevitably exhibited as cancer—the malignancy of which depends upon the extent to which such ectopic trophoblast is resisted. Thus in the unitarian thesis we see the malignant component in *all* exhibitions of cancer deriving from precisely the same cell type from which the chorionepitheliomas arise. We see all producing the same cell type—trophoblast. We see this cell doing ectopically precisely what it does in its normal canalization: eroding, infiltrating, and metastasizing.

"One of the most important problems in cancer research," Greenstein[55] points out, "is concerned with the question of why primary tumors metastasize." If cancer is trophoblastic, the problem of metastases is resolved: the normal pregnancy trophoblast is the *only* cell in the life-cycle that regularly metastasizes, doing so throughout the maternal host in the early months of pregnancy.[56, 57]

The stimuli to malignant differentiation are exemplified in the sex steroids which induce the meiosis of diploid totipotent cells in their normal canalization. In view of the relatively specific organizer action of steroids, it is significant that practically all of the carcinogens are either steroids or, like diethylstilbestrol, possess the physiological properties of steroids. Though carcinogenesis may be mediated by highly diverse means, the ultimate common pathway involves the apposition of competent cell and organizer stimuli. The competent cell is always a totally undifferentiated cell (diploid totipotent cell) and the organizer stimulus ultimately involved appears to be a steroidal compound.

Agents producing a chronic inflammation can also prove indirectly carcinogenic, since chronic inflammatory sites have a marked capacity for localizing or concentrating steroidal sex hormones as well as other substances.[58] Certain chemicals may also prove indirectly carcinogenic through impairing the somatic detoxification mechanism for steroids.[59, 60] That under special and very limited circumstances viruses may also contribute to the common pathway by which malignant differentiation is accomplished in birds* and rodents is recognized. Virchow, however, pointed out 90 years ago that no stimulus can elicit from a tissue potencies not inherent within the tissue. The general consensus is that the role of the cancer virus is evocatory, eliciting from the organism an inherent potency; rather than creative, conferring *de novo* the cancer cell upon the organism.

ESTROGENS

Since the meiosis of normally canalized deploid totipotent cells is accomplished in both sexes through the organizer action of steroidal sex hormones, a review of the formidable literature on the carcinogenic properties of estrogen correlated with the unitarian thesis would be most pertinent to a complete elucidation of the thesis. Space will not permit this, and it must suffice to say that the normal estrogens bear as crucially a basic relationship to the origin of malignant cells, under ordinary cir-

*The phylogenetic homologue of the trophoblast (extra-embryonic blastoderm) in birds is known to exhibit, under certain conditions, malignant properties: e.g., anidian formation.[61]

cumstances, as chorionepithelioma bears to their cellular identity.

VIRUSES AND SOMATIC MUTATION

Since the virus theory is subsumed under the unitarian thesis—as a specialized contributory means† of eliciting the malignant differentiation—the chief remaining theory is the somatic mutation hypothesis. This hypothesis explains nothing and is, in fact, little more than a circular definition: cancer is due to a change; a change is a mutation. This change occurs in the body or soma; therefore, cancer is due to a somatic mutation. On the other hand, the trophoblastic or unitarian thesis does embrace a very definite genetic "mutation." This "mutation" is expressed as meiosis whereby, with the division of the consequent gametogenous cell, the ectopic trophoblast (cancer) cell presented to the soma is, through the necessity of meiosis, *of a genetic composition unique from the soma;* and, therefore, in the most literal genetic sense a neoplasm.

Even were one uncritically to accept the somatic mutation hypothesis[63] or the virus theory of cancer,[64] it would be necessary either to seek their resolution in the unitarian or trophoblastic thesis or to turn to a non-unitarian explanation. In which case it would be necessary, then, to postulate an indefinitely large variety of unknown cancer viruses or a similar variety of unknown somatic mutations to account for the origin of the cancer cell. But not even these would suffice since neither hypothesis could account for the fiercely malignant behavior of normal trophoblast *in vitro*—nor for the fact that this cell has never been found in a non-pregnant organism except as cancer.

MEIOSIS

We have observed that the extra-genital dispersion of diploid totipotent cells is a commonplace fact. We have specifically ascribed the origin of all morphological exhibitions of cancer to the meiosis of one or more such diploid totipotent cells with the consequent production of a gametogenous cell whose only alternative to death is division with the resulting production of trophoblast.

In the normal reproductive canalization the *only* way in which trophoblast can arise is through the meiosis of a diploid totipotent cell and the consequent division (non-sexually or by fertilization) of the resulting gametogenous cell to produce trophoblast. Therefore, one question alone remains here: can the same diploid totipotent cell in an extragenital site undergo meiosis to eventuate in trophoblast production?

As early as 1870 Arnold observed gametoid (meiotic) mitosis in malignant tissue. About twenty years later Farmer, Moore and Walker reported the occurrence of meiosis (heterotypic mitosis) at the border of malignant tumors.[65] In 1929 Evans and Swezy described in inflamed somatic tissue changes "strikingly similar to those of meiotic mitosis."[66] In 1936 Hearne observed meiotic changes in tissues cultured with methylcholanthrene[67] and Molendorff made similar observations in 1939 with estrone.[68]

Diploid totipotent cells are dispersed throughout the soma. Meiosis occurs within the soma. Frank trophoblast cells occur within the soma—though inevitably in a malignant exhibition. They can arise only through the division of a gametogenous

†Joseph Needham[62] has cogently remarked: "It is an instructive exercise to read through the writings on the virus theory of cancer, substituting the words 'active agent' or 'active extract' for virus wherever it occurs. The results are illuminating."

cell produced by the meiosis of a diploid totipotent cell. Frank trophoblast cells have never been found in the soma except as the most malignant exhibition of cancer—with the exception of pregnancy.

Indeed, the difficulty is no longer one of accounting for the origin of the definitive malignant cell through the phenomena discussed, but rather one of seeking *any* explanation of how the meiosis of ectopic diploid totipotent cells, exposed to adequate organizer stimuli, could invariably be averted so as to preclude their normal differentiation to trophoblast, whose ectopic exhibition has never been known except in a malignant fashion. Frankly exhibited, such trophoblast comprises the most malignant exhibition of cancer possible, though when morphologically masked by the somatic response of the hostal cells the malignancy of such trophoblast is moderated.

UNITARIAN VS. NON-UNITARIAN THESIS

The body of experimentally established facts comprising modern oncology is formidable. It is not possible for any explicitly defined thesis to stand unless it is congruent with, or at least not contradictory to, such facts. Only the unitarian thesis finds such congruence. To the unitarian thesis in general and in particular to the preceding data outlined for it, it is especially instructive to apply Herbert Spencer's criterion of truth—the inconceivability of the opposite. The thesis opposite or alternative to the unitarian one is that each morphological exhibition of cancer represents a biologically distinctive phenomenon, each with a malignant component different from all others. This would mean literally hundreds of basically different types of cancer cells—each type being normally unrepresented in the life-cycle; therefore, each being spontaneously created. Not only would it become necessary to postulate the existence of hundreds of distinct species of cancer cells, but also a postulate of an almost infinite number of subspecies of each type of cancer cell would be required to account for the varying degrees of malignancy exhibited by a given malignant lesion in the course of its evolution. Since a single chemical carcinogen can evoke practically any malignant exhibition, then it would become necessary—according to any non-unitarian concept—to conclude that causes which are alike produce effects that are unlike. On the same basis, the occurrence of the frankly exhibited trophoblast cells of extra-genital chorionepithelioma in the male (identical with those of the primary uterine form) would necessitate the unbiological conclusion that cells which are alike arise from cells that are unlike. The logical negation of *any* non-unitarian hypothesis is further apparent in the experimentally defined uniformity of cancer cells in every one of over twenty factors studied to date. (p. 1)

In contrast to the alternative non-unitarian hypothesis, the unitarian thesis holds that the malignant component in all exhibitions of cancer is the same; that this component is not spontaneously created but represents the most primitive cell in the life-cycle; that this cell arises not through "reversion" but through differentiation; that the varying morphological exhibitions are simply conditioned by the nature and resistance of the tissue in which the ectopic trophoblast finds itself; and that the malignancy of the exhibition is, roughly, expressed in the degree of deformation of the somatic tissue by the ectopic trophoblast—and that this is reflected in the morphology from which histological diagnoses derive.

The unitarian thesis and the trophoblastic thesis are of logical necessity synonymous: the most malignant exhibition of cancer (chorionepithelioma)

comprises cells intrinsically identical with pregnancy trophoblast cells.* Then, if cancer is an unitarian phenomenon, the malignant component of the varying morphological types must be trophoblastic; for, two quantities equal to a third are equal to each other.

Finally, were we to set aside all else evidential of the unitarian or trophoblastic nature of cancer, and scrutinize but a single datum, we should find that neither experimental fact nor scientific reasoning can offer any alternative to the trophoblastic nature of cancer in explanation. This one datum is the fact that many authors over the past half century have described frank trophoblast (chorionepithelioma) metastasizing from a primary site to appear at the secondary site in an adenocarcinomatous or other exhibition.[69, 70, 71] And the converse has frequently been seen.[72] Moreover, frankly exhibited trophoblast (chorionepithelioma) often has been described as merging by imperceptible degrees into an adenocarcinomatous or sarcomatous exhibition. In their comprehensive monograph on chorionepithelioma, Park and Lees (1950) write: "There is no doubt that in many instances of testicular chorionepithelioma, certainly in several of our sections, characteristic trophoblast merges imperceptibly with areas of undifferentiated tissue whose hostal origin would never be questioned."[73]

THE TROPHOBLAST AND THE PANCREAS

John Beard, a lecturer in embryology at the University of Edinburgh, first published on the trophoblastic thesis of cancer in June, 1902.[74] By February 1905 he reported, on embryological grounds, the antithesis of the pancreatic enzymes to the trophoblast cell;[75] and, a few years later he specifically pointed out that the cancer or trophoblast cell protected itself against pancreatic enzymes through the production of specific antitryptic substances.[76] The occurrence of tryptic inhibitors in cancer sera has, during the past forty years, been described by at least fifteen different workers,[77–92] though not within the context of the trophoblastic thesis.

In 1947 Krebs, Krebs and Gurchot first pointed out the specific antithesis of chymotrypsin to the malignant (or trophoblast) cell.[93] In 1948 Clark, Cliffton and Newton further confirmed the specific antitryptic antithesis of the cancer cell and offered evidence for the diagnostic and prognostic utilization of the phenomenon. In 1949 West and Hilliard, in the study of the sera of over 3,000 cancer patients, reported the specific antithesis of the malignant cell to chymotrypsin by showing that 15 grams of crystalline chymotrypsin would be necessary—in a single dose—to neutralize all of the *average excess of* chymotrypsin inhibitor in the serum of the advanced cancer patient. The latter workers proposed the utilization of the specific antichymotryptic titer of the serum for prognostic but not necessarily diagnostic purpose.[88, 91]

It is noteworthy that West and Hilliard, as well as others, have described a quantitative relationship between the concentration of cancer cells and the titer of specific chymotrypsin inhibitor. This titer was observed to fall after the surgical removal of the malignant tumor and to rise linearly with its recurrence. Thus the data on the antitryptic properties of cancer sera are not only proof of the antithesis between the cancer cell and the pancreatic enzymes, but are further evidential of the unitarian—and thereby trophoblastic—nature of cancer.

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*The malignant exhibition of the trophoblast of the placenta is the expression of a lack of *extrinsic* growth restraints against the trophoblast; this fact was demonstrated in the tissue culture of normal rabbit trophoblast.

Since the malignant cell is not spontaneously created but has its normal counterpart in the most primitive cell of the life-cycle, each organism in the span of its own gestation destroys the cullular counterpart of cancer. This destruction is accomplished through the pancreatic enzymes, notably chymotrypsin and amylase.

When the mammalian organism totally fails in this, the pregnancy trophoblast overgrows as chorionepithelioma.[94] A partial failure is reflected as a toxemic pregnancy,[95] and/or a hydatidiform mole accompanied by an abnormally high excretion of chorionic (trophoblastic) gonadotrophin. For this reason hydatidiform moles are most frequently associated with toxemic pregnancies, while the risk of sequent chorionepithelioma is 2,000 to 4,000 times greater after hydatidiform mole than after normal pregnancy.[96] The reason for "the much higher curability rate of choriocarcinoma preceded by hydatidiform mole," as reported by Park and Lees,[96] is that the precedent hydatidiform mole represented at least a partially successful antithesis on the part of the maternal host to the trophoblast.*

The reason why primary uterine chorionepithelioma can within a few weeks arise and kill the patient is that this most malignant tumor simply represents a *hyperplasia* of normal trophoblast cells freed from their extrinsic restraint—just as the *in vitro* culture of the rabbit trophoblast freed from the maternal environment yields a fiercely malignant exhibition.

It is well established* (1) that pregnant diabetics exhibit a greatly increased incidence of the pregnancy toxemias; (2) that the severity of such toxemias varies directly with the overgrowth of cellular trophoblast as reflected in the abnormally elevated excretion of chorionic gonadotrophin; (3) that the phenomenon involves a non-insulin deficiency of the pancreas gland; (4) that the predisposition to pregnancy toxemias is noted as early as five years[97-99] prior to the clinical onset of diabetes; (5) that the administration of steroidal sex hormones in such pregnancy toxemias frequently ameliorates the condition; and (6) that this amelioration is reflected in a proportionate depression in the urinary excretion of chorionic gonadotrophin.

Since such steroidal sex hormones as estrogen depress the proliferation of cellular trophoblast both in normal and toxemic pregnancies, as reflected in a depression in the urinary excretion of chorionic (cytotrophoblastic) gonadotrophin, it is significant that Kullander (1948) found in primary uterine chorionepithelioma that the administration of stilbestrol resulted in a clinical improvement that paralleled the decline in the urinary excretion of chorionic gonadotrophin.[100] Though Kullander did not cure his patients, so long as stilbestrol controlled the excretion of chorionic gonadotrophin they improved.

It is a commonplace observation that the administration of estrogen or testosterone during pregnancy will often depress the production of chorionic gonadotrophin sufficiently to cause the Aschheim-Zondek test or its Friedman modification to become negative.

In listing the criteria of malignancy, Oberling and Woglom write: ". . . Above all is the impudent independence called autonomy."[101] Certainly, no other property is more characteristic of the cancer cell than autonomy; *yet in the most malignant exhibition of cancer possible we find the trophoblast cells showing the same susceptibility to the checking influence of sex steroids as is found for the normal pregnancy trophoblast.*

If cancer is trophoblastic, and as such a unitarian phenomenon, it would seem

*The complete bibliography for these data is given in Krebs & Bartlett's (1949) monograph on "The Pregnancy Toxemias, the Role of the Trophoblast and the Pancreas."[95]

that the steroidal sex hormones should suppress the growth not only of pregnancy trophoblast and chorionepithelioma but all other exhibitions of cancer as well. That this would be the case were sufficient localization of the steroidal sex hormones possible at all malignant sites is shown in the fact that these hormones do act to suppress the growth of mammary cancer, prostatic cancer, and their metastases involving the skeletal system. Morphologically, the difference between a primary mammary cancer and a prostatic one is much less pronounced than the difference between either and a primary chorionepithelioma.

The placenta, the prostate, and the mammary gland are notably capable of the selective localization of steroids; hence, trophoblast in any of these areas will show a like response to the injection of steroidal sex hormones. In the case of prostatic and mammary growths the use of the physiologically antagonistic steroid is rational, since such causes the somatic elements in the growth to atrophy. That the palliative effect is dependent upon the ability of the *somatic* elements in the tumor to localize the steroids is shown in the fact that the skeletal metastases from the prostate as well as from the mammary gland are responsive specifically to estrogen and testosterone, respectively. Yet this amenability is lost as, with increasing malignancy, the original somatic elements in the skeletal metastases are lost. That such a loss is not directly due to the increasing malignancy but indirectly to the loss of the specific somatic cells responsible for the localization of the steroids is indicated by the fact that in the placenta, while the localizing somatic elements remain the growth of the vastly more malignant chorionepitheliomatous exhibition is checked.

Thus we find the unitarian principle of cancer implicit in the sex hormone therapy of cancer, as in *all* other useful forms of cancer therapy. Moreover, in the unitarian principle the use of steroidal sex hormones in cancer finds its first rationale.

Since a non-insulin pancreatic deficiency has been identified with the overgrowth of pregnancy trophoblast, which overgrowth has been shown amenable to steroidal sex hormones, two questions arise: (1) what is the nature of the deficient pancreatic factor, and (2) is the deficiency of this factor associated with the overgrowth of *all* trophoblast? About half a century ago John Beard[102-119] found a concomitance between the commencing function of the fetal pancreas, as indicated by the appearance of zymogen granules in the gland, and the precipitate degeneration of the trophoblast or its phylogenetic homologue. Broad comparative studies confirmed his thesis that, in the span of normal gestation, the pancreatic enzymes are responsible for checking the growth and ultimately destroying the gestational trophoblast or its homologue. In fact, Beard's studies were so carefully performed that he was able to state half a century ago that in the 56th day in the span of human gestation the cellular trophoblast undergoes a sudden degeneration. Some 30 years after this work, the trophoblast cell-produced chorionic gonadotrophin was discovered, and only recently has the quantitative technic for the estimation of chorionic gonadotrophin been sufficiently perfected to show that a composite[102] excretion curve for chorionic gonadotrophin made through the span of human gestation coincides[120] precisely with the curve predicted half a century ago by John Beard.

If the urinary excretion of chorionic gonadotrophin persists at the original level after the 56th to 70th day in the span of human gestation, the process is inevitably exhibited as chorionepithelioma. In fact, if the abnormal elevation of chorionic gonadotrophin found in pancreatic dysfunction in pregnancy exceeds a certain level, again the process is exhibited as chorionepithelioma.

In view of the antithesis of the pancreatic proteases to the trophoblast cell it is clear why both pregnancy and cancer are associated with high titers of trypsin and

chymotrypsin inhibitors: antithesis is a two-way street, so to speak.

If the pancreatic enzymes are antithetic to the cancer cell, if they resist the cancer cell as the cancer cell is known to resist them (through the specific antitryptic inhibitors) why does cancer of the pancreas gland occur? Why is it that cancer is not only primary in this gland but that this gland itself may be subject to secondary growths through metastases or direct invasion?

The pancreatic proteases exist in the pancreas in the form of their *inactive* zymogens. These are not converted into the corresponding active enzymes until they are acted upon by the kinases of the blood or, especially, by those of the small intestine. In view of this, one may ask why the small intestine, then, is not practically immune to cancer. Woglom answers this question well in his commentary in an abstract of a paper by Raab:[121, 122, 123] "One of the most striking features about the pathology of malignant disease is the almost complete absence of carcinoma in the duodenum and its increasing frequency throughout the gastro-intestinal tract in direct proportion to the distance from this exempt segment."

It is noteworthy that the small intestine is not only practically immune to primary tumors but also to metastases. A fulminating malignant growth may exist in the pyloric end of the stomach a few millimeters from the immune small intestine, but, as William Boyd points out, "The duodenum is never invaded, the tumor stopping short at the pylorus. Spread to neighboring organs usually involves the liver or the pancreas."[124] The incidence of malignancy is, of course, high immediately distal to the ileocecal valve.

The pancreatic enzymes not only normally occur in the active state in the blood stream, which possesses an optimum *p*H for their action but the clinical determination of serum amylase and trypsin are standard procedures, especially in the pancreatic diseases.

THE PANCREAS AND CARCINOGENESIS

The fact that pregnancy occurs in the presence of a normal concentration of pancreatic enzymes indicates that trophoblast can exist for a while under such conditions. It must be remembered, however, that such trophoblast is: (1) held in check until the 56th day of gestation and almost completely destroyed shortly thereafter (with the commencing function of the fetal pancreas) and (2) that implantation occurs *after* the trophoblast has had about a four-day period of growth anatomically exterior to the host.

The trophoblast carries with it its own antitryptic enzymes against the pancreatic proteases. As we have seen, *carcinogenesis involves ectopically precisely the same basic mechanisms involved in the production of canalized trophoblast.* The prolonged exposure of a tissue to caricinogens results in a prolonged depression in its respiratory mechanisms.[125] This may result in the appearance and persistence of ectopic trophoblast in the exposed tissue. The trophoblast or cancer cell is autonomous of the hostal respiratory system and is obligatively anaerobic, undergoing aerobic glycolysis even in the presence of a free oxygen supply.[126] The trophoblastic thesis explains the long-known identity of trophoblast cell metabolism with that of the cancer cell:[127, 128, 129] an obligative anaerobic system is obviously a necessity in a primitive parasitic cell like the trophoblast (or cancer) cell.

When cancer is elicited experimentally from a normal laboratory animal, the lesion usually does not metastasize, but attains a large size and is almost completely somatic. Herein reside the scientific limitations of artificially induced or transplanted animal tumors in the scientific study of chemotherapeutic agents. Such

tumors are practically benign in a biological sense. Because the pregnancy trophoblast regularly and normally metastasizes in the early phase of gestation, we must expect metastases ultimately in any "full blown" cancer.

While a low-grade malignant growth (primarily somatic tumefaction) can be induced ultimately by sufficient carcinogenic stimuli in the presence of normal pancreatic function, a highly malignant exhibition is invariably accompanied by at least a relative pancreatic insufficiency implicit in the correspondingly high serum titer of antitryptic and antichymotryptic enzymes.

That the induction of the ectopic trophoblast is usually accomplished against great difficulty—regardless of pancreatic adequacy—is indicated in the fact that non-chorionepitheliomatous exhibitions in man usually have a latent period of years, while a chorionepithelioma in pregnancy may arise from the preexisting trophoblast and destroy the host within a few weeks.

The extent to which the soma resists malignant involution is reflected in the fact that only two cellular differentiations—meiosis of the diploid totipotent cell and subsequent division of the resultant gametogenous cell—divide the malignant cell from the benign one. This explains the all-or-none suddenness classic to the malignant change—and the absence of true transitional cells.

CANCER A COMPOSITE TISSUE

The malignant lesion is a composite tissue comprising (1) trophoblast plus (2) somatic elements. The malignancy of a lesion varies directly with its concentration of trophoblast and inversely with its concentration of somatic elements. The normal placenta, too, represents a composite tissue; for, here the trophoblast cell finds its normal canalization in the life-cycle. Just as the malignancy of a placenta, in a chorionepitheliomatous exhibition, varies directly with the concentration of trophoblast cells, so in the ectopic presentation of trophoblast that comprises cancer the malignancy of the lesion varies with its concentration of trophoblast. The only fundamental difference is that in the latter the trophoblast cells are morphologically masked by the resisting soma—except in the most malignant of extra-genital tumors: chorionepithelioma.

A tissue can be malignant only by being a composite one. Malignancy is an antithetic relationship between cells and finds being by virtue of a thetic benignancy. In its simplest terms, then, a malignant tumor comprises somatic tumefaction plus a malignant component. It is for this reason that the greatest tumefaction is usually associated with the least malignant exhibitions and the least tumefaction often with the most malignant exhibitions. Since trophoblast normally metastasizes, tumors of the highest malignancy and lowest tumefaction tend to be the most metastatic. Thus the increase or decrease in the malignancy of a given tumor is not the result of a continuing spontaneous generation of an infinite variety of cancer cells, *but merely the expression of the increase or decrease in the concentration of* A CONSTANT MALIGNANT COMPONENT. As the antithesis of this component determines the malignancy of the lesion so that the soma determines its benignancy.[130]

LEUKEMIA

In the leukemias the constant malignant component (trophoblast) is present in the lymphopoietic or myelopoietic tissues. The reaction of such tissues to the malignant component results in the proliferation of *somatic* white blood cells of varying degrees of maturity. This is the counterpart of tumefaction in the sessile tumor. Thus the unitarian or trophoblastic thesis, different from the non-unitarian concept,

finds no contradiction in the fact that often the most malignant phase of the leukemic process—the so-called aleukemic leukemia—actually involves a leukopenia. This phase is the most malignant because the somatic cells (leukopoietic tissue) have lost their ability to resist through virtue of the destruction of the leukopoietic tissue by ectopic trophoblast. For this reason the aleukemic or leukopenic stage is often terminal to a preceding highly leukemic or leukocytic phase.

TROPHOBLASTIC HORMONES

The routine utilization of the trophoblastic hormone, chorionic gonadotrophin, is, of course, a clinical commonplace as a means of diagnosis as an index to therapeutic response in the case of the most malignant exhibitions of cancer—the chorionepitheliomas and certain other exhibitions of cancer. The excretion of this hormone varies directly with the malignancy of the tumor, which, in turn varies directly with the concentration of trophoblast cells.

In 1944 Roffo[131] reported a similar gonadotrophin in all of 1,000 cancer patients examined, and none in the blood or urine of the control series—with the exception of pregnancy, of course. In 1946 Krebs and Gurchot[132] reported the identification of Roffo's gonadotrophin as trophoblastic. In 1947 Beard, Halperin and Liebert published a confirmation of the prior papers and suggested a practical utilization of the phenomenon.[133] Prior to these studies numerous scattered reports of chorionic gonadotrophin in cancer serum and urine appeared in the literature but without the context of any unified theory. Zondek reported the hormone in the urine of 82 per cent of females afflicted with cancers of the genital organs and in 36 per cent of female patients suffering from extragenital tumors.[134, 135] Five years later Zondek was able to duplicate and extend his original findings,[136] which had been confirmed by others.[137–139]

It is necessary to emphasize that the original work of Zondek as well as other workers was done on the erroneous assumption that the hormone was produced by the anterior pituitary gland. Even after tissue culture studies had proved the trophoblast-cell-origin of the hormone, its occasional identification in cancer urines, through the use of the Aschheim-Zondek or Friedman tests, was usually dismissed as an inexplicable datum of an inexplicable disease. Only within the context of the unitarian or trophoblastic thesis was sufficient theoretical justification found to concentrate and selectively extract the urines of the less malignant exhibitions of cancer specifically for the same hormones (chorionic gonadotrophin and syncytial steroids) always found by ordinary technics in the most malignant exhibitions.

Thus to the already established uniformities for 20 or more known factors among the various exhibitions of cancer, we now find an hormone (not only evidential of the unitarian thesis but of the specific trophoblastic nature of cancer as well) in the trophoblast cell-produced hormones. *Like all other uniformities found in the malignant lesion,* that for the trophoblastic hormones becomes increasingly apparent with the malignancy of the growth, so that frank chorionepitheliomas are found excreting as many as one million International Units of chorionic gonadotrophin every 24 hours, while the much less malignant exhibitions with no frank trophoblast cells excrete 50 or fewer units of the trophoblastic hormone.

DIAGNOSTIC IMPLICATIONS

There are only two fundamental kinds of cancer tests: (1) the indirect tests concerned with the detection of a substance produced *by the soma* as the result of the

presence of cancer cells; and (2) the direct tests concerned with the detection of a substance produced by the cancer cells themselves. Though the incidence of a specific somatic change may bear a high correlation with the presence of an uniform stimulus, the correlation can never be a truly specific one, since obviously no *somatic* reaction is so specifically reserved for the presence of cancer or trophoblast cells that it can not be falsely elicited by other stimuli.

The limitations of the indirect tests have been well demonstrated in practice. The only reliable and generally accepted serum or urine tests for cancer are the direct ones, such as the Aschheim-Zondek test and its numerous modifications. Just as hundreds of indirect tests have been tried and discarded for pregnancy diagnosis, so have hundreds of indirect tests for cancer been tried and then discarded. The only tests for either pregnancy or cancer that have survived are those *direct* tests depending upon the identification of a substance unique to cancer and pregnancy: the hormone of the trophoblast cell. Since cancer is trophoblastic, its most malignant exhibition—chorionepithelioma—is highly amenable to the direct test. In fact, the possibility of either an indirect or direct general diagnostic test for cancer depends upon cancer being an unitarian phenomenon.

The efficient clinical implementation of the trophoblastic or unitarian thesis depends upon the development of a simple, reliable and highly accurate quantitative test for the specific products of the trophoblast cell.

While we have identified the presence of chorionic gonadotrophin in the urines of patients with all exhibitions of cancer, we have found the technological evolution of a quantitatively precise chorionic gonadotrophin test difficult for the less malignant exhibitions of cancer. When we consider that a chorionepitheliomatous exhibition of cancer in the male may yield over 1,000,000 I. U. of chorionic gonadotrophin while metastatic testicular cancers of a much lower malignancy—though biologically still more malignant than most extragenital growths—may yield fewer than 50 I. U. for a like volume of urine, then the physical difficulties in the case of most of the extragenital tumors of still lower malignancy is obvious.

From the urines of patients with the common exhibitions of cancer, the authors have obtained highly active preparations of chorionic gonadotrophin, and are now engaged in the crystallization of chorionic gonadotrophin, by the method of Gleason, Högberg and Westman (1948),[140] from pooled urines of various exhibitions of cancer. It is recognized that the specific steroidal hormones of the syncytial trophoblast also comprise a most important avenue to the development of a satisfactory diagnostic technic. However, these steroidal hormones have not been studied as intensely as chorionic gonadotrophin which is now characterized as a glucoprotein containing 18 per cent acetylglucosaminedigalactose polysaccharide.

Several cancer tests relying on the detection of trophoblastic hormones are now under study for the purpose of achieving a sufficiently practical quantitative test for general use.

CLINICAL IMPLICATIONS

As a composite tissue, cancer in its somatic component represents many diseases; in its constant malignant component, one disease; and, in its totality, a local manifestation of a general disease. Since the perspective of the clinician is necessarily anthropomorphic, he sees cancer primarily in its somatic phase as a series of many diseases. On the other hand, as Oberling and Woglom have so aptly phrased it, "To the experimentalist cancer is one disease and one disease only."

Both clinician and experimentalist are generally agreed that the somatic or ana-

tomical changes produced by the malignant process are largely irreversible. Surgical extirpation or the primarily non-selective cautery of radiant energy may destroy the composite tissue of a primary tumor. But the vague hope for an agent that will cause the "reversion" of an organized malignant tumor to normal tissue is scientifically indefensible. Aside from the physical destruction of the tumor itself, one primary factor can contribute to the amelioration of the effect of the tumor on the host. This is the growth inhibition or destruction of the constant malignant component of the tumor. Selective ablation of the malignant component will not alter the already existing somatic dysplasia nor histologically change the architectonics of the tumor, except in highly malignant anaplastic exhibitions. Here the histological as well as the gross changes take an expected course: an histological increase in connective tissue elements with a palpable increase in fibrosity.

In the advanced and well organized lesion, the possible changes are not, as a rule, dramatic. Were the malignant component ablated, the somatic component would tend to persist largely unchanged, or even show a slight increase in benign tumefaction. Since none of the cells in a malignant tumor is *per se* a "diseased" or pathological cell, but rather a cell normal to the life-cycle, cancer does not itself produce any "toxic effects."* Its lethality is eminently a physical matter involving the normal behavior of normal trophoblast in a spatially abnormal relationship.

Above all, cancer is a natural phenomenon ultimately involving the soma in irreversible changes. To question the results expected from the selective ablation of the constant malignant component in a malignant lesion would be to suggest that, aside from actual tumor destruction, no malignant tumor has ever spontaneously regressed, that no highly anaplastic cancer has even spontaneously gone into a less malignant scirrhous exhibition, or that no patient has ever survived for five years or more after exhibiting an inoperable and highly malignant lesion. It is not necessary to review here an impressive literature on spontaneous regression. Much more important to a sound comprehension of the clinical implications of the trophoblastic or unitarian thesis are the thousands of cases of cancer in which the host is able to resist and to live with the cancer cells for years.

What are the factors—cells, tissues, organs, and their secretions—contributing to such resistance? What causes trophoblast in the pregnant diabetic to overgrow, despite a normal insulin supplement? Why do the specific inhibitors to pancreatic chymotrypsin and trypsin rise with the increasing malignancy of a growth and decline following its amelioration? Why is the small intestine practically immune not only to primary tumors, but to direct invasion and metastases as well? Why does the growth of the invasive, erosive and metastatic trophoblast of normal gestation cease and degeneration commence concomitant with the commencing function of the fetal pancreas gland? Why does the urinary excretion of chorionic gonadotrophin fall concomitantly with the degeneration of the trophoblast? After more than 99 per cent of the trophoblast has been removed from the placenta, why does its size remain unaffected though its invasive and erosive properties are entirely lost? Who are pregnancy trophoblast cells often indistinguishable histologically from the somatic cells in the uterine wall of the pregnant host? Why is it that the removal of normal pregnancy trophoblast to tissue culture will result in a fiercely malignant exhibition of such trophoblast toward *all* nontrophoblast cells?*

*The answers to these questions reflect the cogency of Oberling's prediction: "Some day, perhaps, it will turn out to be one of the ironies of nature that cancer, responsible for so many deaths, should be so indissolubly connected with life."[118]

Any attempt to implement clinically the trophoblastic or unitarian thesis should be made in the light of the answers to these questions.

RADIATION

Were malignant cells actually selectively susceptible to radiations, the most malignant exhibitions of cancer would be the most amenable to therapy, since they would, then, contain the highest concentration of radio-sensitive cells. Chorionepithelioma and malignant melanoma represent two of the most malignant exhibitions of cancer, yet they are radio-resistant. Glioblastoma multiforme and neurogenic sarcoma are also examples of highly malignant exhibitions of cancer that are radio-resistant.

We may generalize that the malignant component of a tumor is *slightly* less radio-resistant than the somatic connective tissue stroma but considerably more radio-resistant than the somatic parenchyma. This is why radiation often results in an increase in tumor fibrosity, which would be an excellent sign were this achieved at the cost of the radio-resistant malignant component (trophoblast) rather than at the cost of the somatic parenchyma. The so-called radio-sensitivity of a tumor is determined primarily by the radio-sensitivity of the somatic cells in which the constant malignant component happens to reside, not by the uniformly radio-resistant constant malignant component: the ectopic trophoblast.

RADIO-ACTIVE ELEMENTS

The most commonly used radio-active element is that of iodine in the therapy of cancer of the thyroid. Rhoads[141, 142] describes the limitations of this therapy as follows: "The more malignant and destructive forms tend to pick up (radio-active iodine) to a lesser and lesser degree as the invasiveness increases." With an increase in the malignancy of the exhibition, there is necessarily an increase in the concentration of the definitively malignant cells (trophoblast) and a consequent decrease in somatic thyroid cells which are the only cells involved in the selective uptake of radio-active iodine. The decrease in tumefaction as a result of the uptake of radio-active iodine is an expression of the loss of functional somatic cells. This fact is further demonstrated in the successful use of this technic in toxic goiter.

SURGERY

The lower the concentration of trophoblast cells in a malignant lesion, the more amenable the lesion is to successful surgery. For this reason highly malignant growths like chorionepithelioma are generally inoperable.

PANCREATIC ENZYME THERAPY

The palliative use of the crystalline pancreatic enzymes in advanced human cancer rests *entirely* upon the validity of the unitarian or trophoblastic thesis of cancer.

CONCLUSION

Our own studies, too, appear to confirm the unitarian or trophoblastic thesis of cancer. The independently proved uniformities—which increase in degree of uniformity with the malignancy of the growth—of malignant lesions in the concentration of eight water-soluble vitamins; in vitamin C content; in water content; in cytochrome-c; in effect on liver catalase of the host; in Warburg's criteria of glycolysis;

in lactic acid formation; in sugar content; in the respiratory response to added substrates; in a common means of induction; in antichymotryptic factors; in autonomy, invasiveness and erosiveness; in ability to metastasize; in amenability to universal therapeutic measures; in the general anticarcinogenic effect of caloric restriction on the incidence of mammary tumors and leukemia alike in experimental animals; in heterotransplantability; in loss of specialized function as malignancy increases (in all tumors except chorionepithelioma); in departure from the histology of the site of origin (except in primary uterine chorionepitheliomas);* in numerous enzymes—all these uniformities, indeed, exclude any but an unitarian nature of cancer. Then as we examine the most malignant exhibition of cancer possible—chorionepithelioma—to find it comprised of trophoblast cells indistinguishable cytologically, endocrinologically or otherwise from those of normal pregnancy trophoblast, the fact becomes impelling that if cancer is, indeed, an unitarian phenomenon, all of its properties must be exemplified in these most primitive of all cells in the life-cycle, the trophoblast cells. These cells in their normal canalization of pregnancy (as well as *in vitro)* exhibit *every known property of malignant cells*—though normally directed in pregnancy toward the physiological exploitation of the truly malignant process implicit in the embedding of the tissue of the conceptus into that of the mother.

Then, were all else evidential of the unitarian or trophoblastic nature of cancer set aside, and were there left for scrutiny but the single fact that primary exhibitions of trophoblast (chorionepithelioma) are not infrequently seen that metastasize to an adenocarcinomatous or sarcomatous exhibition, and vice versa, then reason would admit of only one explanation: the trophoblastic or unitarian fact of cancer.

Were the cellular counterpart of cancer not an inextricable component of the life-cycle, represented in the most primitive cell of that cycle, the processes of natural selection themselves would have precluded the survival of the spontaneously generated cells that any alternative to the trophoblastic fact of cancer necessitates.

The unitarian thesis is not a dogma inflexibly held by its proponents; it is merely the only explanation that finds *total* congruence with *all* established facts on cancer. While the unitarian or trophoblastic thesis seemingly admits of no alternative, it warrants the most corrosive scrutiny. For cancer either is or is not an unitarian phenomenon, and thereby it is either trophoblastic or not trophoblastic in nature. The definitive cancer cell is either the most primitive cell in the life-cycle or it is not the most primitive. It is either the result of the *differentiation* or meiosis (however spatially or temporally anomalous) of a cell or it is not the result of cellular differentiation. It either has its normal cellular counterpart in the life-cycle, and thus is the result of cellular differentiation; or it has no cellular counterpart in the life-cycle,

*These are, indeed, instances in which the exception *proves* the rule; for, were cancer not trophoblastic, its most malignant exhibition—chorionepithelioma—would then show the greatest loss of function and the greatest deviation from the histology of the site of origin, instead of actually showing an accentuation in the normal function of trophoblast, as it does. Yet were one to attempt to ascribe to the malignant exhibition of trophoblast some *intrinsic* but subtle change from that of the non-malignantly exhibited trophoblast, such an attempt would be rendered nugatory by the fact that the most malignant exhibition of cancer possible in the male—chorionepithelioma—comprises trophoblast cells indistinguishable from those of pregnancy or chorionepithelioma in the female; yet, in the male chorionepithelioma represents the widest possible deviation in histology and function from the site of origin. The latter fact corroborates the proof of a rule previously proved by its exception.

does not arise through cellular differentiation, and, therefore, is spontaneously created. The diploid totipotent cells within the soma, like their normally canalized daughter cells, can either undergo meiosis and subsequent trophoblast production, in response to sufficient organizer stimuli, or they can not. The occurrence of frank trophoblast cells within the soma *(invariably* as the most malignant exhibition of cancer) is either the result of the meiosis of a diploid totipotent cell or it is not; and, therefore, is the result of a spontaneous generation. The trophoblast or the cancer cell either produces specific inhibitors to pancreatic chymotrypsin and trypsin, or it does not (and the twenty or so independent workers who have so reported are all in error). A malignant tumor is either a composite tissue or it is not a composite tissue. The malignancy of a tumor is either determined by the concentration of a constant malignant component; or it is not so determined and depends, therefore, upon the successive spontaneous generation of a series of specific cells to account for the increasing malignant evolution of the tumor.

The trophoblastic or unitarian thesis holds the affirmative of all these propositions. It holds that *any* alternative to them will result in a *reductio ad absurdum.* The unitarian thesis recognizes the need for an orderly defined common ground of theory upon which all workers in cancer may at least meet, if not agree. It holds as reasonable the thesis that the more tenable of *two distinctly opposed hypotheses* should be given the greater credence in determining the direction of future research. It holds that in the intensive study of the peculiar metabolism of trophoblast both in pure cultures and *in vivo,* with the goal of the selective lysis of the trophoblast cell or the occlusion of its metabolism, the cancer problem may find practical resolution. It holds that the cancer problem need not offer amnesty to unbridled empiricism and negation to the most basic tenets of the rational process.

Above all else, the trophoblastic or unitarian thesis urges that the alternative non-trophoblastic or non-unitarian thesis, which is at present overwhelmingly the dominant hypothesis, be scrutinized in the light of whatever experimental evidence might exist in its support.* Indeed, the evaluation of *any* alternative to the trophoblastic or unitarian thesis—within the context of experimental facts and scientific logic—by those who find the trophoblastic or unitarian thesis untenable or tenuous[143, 144] should prove most instructive. For in cancer, as in all else, facts do not speak for themselves but must be spoken for.

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*In reviewing over 17,000 papers on cancer and related biological subjects the senior author, in the course of his text on "The Biological Basis of Cancer," has not found a single valid contribution that fails to find congruence with, and illumination from the trophoblastic or unitarian thesis of cancer.

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III

NITRILOSIDES (LAETRILES)

Their Rationale and Clinical Utilization in Human Cancer

Ernst T. Krebs, Jr. and N. R. Bouziane, M.D., Ph.D.

INTRODUCTION

Some twenty years of research by Ernst T. Krebs, Jr., and associates of the John Beard Memorial Foundation in California have confirmed the suggestion of John Beard of Edinburgh University sixty years ago that the primitive trophoblast cell is the constant malignant component of all exhibitions of cancer. At least one chemical produced by this cell, human chorionic gonadotrophic hormone (HCGH), permits detection of cancer at a very early stage.

We have been using non-toxic nitrilosides (Laetrile), to which the trophoblast is susceptible, on terminal cancer cases for more than three years in Canada under the sponsorship of The McNaughton Foundation. Obviously, the nitrilosides (Laetriles) would be better used prophylactically or therapeutically at a much earlier stage in the disease.

The results of this clinical evaluation will be presented following an outline of the scientific basis of this approach.

SCIENTIFIC BASIS OF THIS THERAPY

Effective, rational chemotherapy in human cancer depends ultimately upon whether this is biologically and biochemically a single disease or a multiplicity of diseases. As proponents of the Unitarian or Trophoblastic Thesis of Cancer[1] we believe that all established evidence supports the former. We maintain that the trophoblast cell is the constant malignant component not only of the malignant exhibition of cancer, chorionepithelioma, but also of all other exhibitions of cancer however morphologically it is masked; and that it is in every way identical with normal pregnancy trophoblast.

It is another tenet of Beardianism that, just as the trophoblast of pregnancy is held in check first by the normally functioning maternal pancreas alone, and later by the fetal pancreas as well, the malignant induction of ectopic trophoblast likewise is prevented by the enzymatic processes of an intact pancreas. Should there be a

deficiency, however, of pancreatic enzymes (be it of genetic, infectious, degenerative, etc., origin) the uninhibited overgrowth of the placental of ectopic trophoblast results in a hydatidiform mole or a chorionepithelioma, or in an exhibition of malignancy at the ectopic site as the case may be.

From theoretical consideration, then, the use of modified, more sensitive, micro-Aschheim Zondek tests[2,3] should demonstrate the presence of chorionic gonadotrophin[4,5] in the blood and urine of patients with chorionepitheliomas and much lower concentrations of this same cytotrophoblastic hormone in all other exhibitions of cancer—the concentration being proportional to the biological level of malignancy.[6] These micro-Aschheim Zondek tests can also be used to evaluate the response of all types of cancer to chemotherapeutic agents.

Roffo's laboratory, Howard Beard, and Navarro and his colleagues at the University of Santo Tomás and the municipal hospitals of Manila have all reported 95-100% positive and negative accuracy in large series of cancer and non cancer patients respectively. They have all reported instances of subclinical detection of cancer or its recurrence prior to biopsy, cytology study, or Roentragram. Clinical investigators with Laetrile have reported cases in which consistently positive HCGH tests have become negative after parenteral administration. The amelioration of nonspecific signs and symptoms associated with positive reactors has accompanied many such instances.

BETA-GLUCURONIDASE

Independent of the foregoing considerations, Fishman[7] in 1947 reported the presence of β-glucuronidase in malignant tissue. This enzyme, which hydrolyzes β-glucuronoside after the latter has been produced by oxidation of β-glucoside, was first reported to exist in animal tissue by Sera[8] in 1914. Fishman and Anlyan[9, 10, 11] have described levels of β-glucuronidase in surgically removed specimens of cancers of the breast, uterus, stomach and mesentery, abdominal wall, and esophagus 100 to 3,600 times as high as levels of this enzyme in corresponding uninvolved tissue. While they have empirically interpreted this as "a metabolic response of the tissue to estrogen or a related substance", Beardianism[12, 13] maintains that this is directly related to the fact that the syncytial trophoblast produces abundant quantities of estrogenic and related steroids. These steroids elicit from the hostal tissue the production of β-glucuronidase necessary for their detoxification as the corresponding β-steroid glucuronosides, which are ultimately excreted in the urine as physiologically inert.

RHODANESE

In addition to their high levels of β-glucuronidase, malignant lesions are characterized by a generally profound deficiency of most other enzymes and a specific deficiency in rhodanese, as was reported by Homburger,[14] and Mendel, Rodney and Bowman.[15] Rosenthal reported an 80% decrease in rhodanese in hepatomatous liver tissue, and a similar decrease was found in the leukemic invasion of tissues.[16]

Lang,[17] who discovered this enzyme in 1933, found that it converts hydrocyanic acid to rhodanate (thiocyanate or sulfocyanate) in the presence of thiosulfate or colloid sulfur thusly: $HCN + Na_2S_2O_3 \longrightarrow Na\,SCN + NaHSO_3$. Sumner and Somers[18] point out that rhodanese undoubtedly prevents the accumulation of excessively toxic exhibitions of HCN arising from the scission of dietary β-glucuronosides and β-glucosides by paralleling them both in sites of occurrence and in concentration. It exceeds the concentration of β-glucuronidase and β-glucosidase

in all but malignant tissues. Whether or not human chorionic gonadotrophin produced by exhibitions of lesser malignancy accounts for the absence of rhodanese in the definitely malignant (trophoblast) cells, the fact that it does account for such rhodanese deficiency in the immediately contiguous somatic cells was demonstrated by Sanchez and Bertran.[19] They reported that five international units of an aqueous solution of chorionic gonadotrophin 24 hours after injection decreased rhodanese activity in the tissue of rats 90% or more.

CYANOPHORIC GLUCOSIDES AND CYANOPHORIC GLUCURONOSIDES

Aware of the high concentration of β-glucuronidase in malignant tissue, Danielli[20] in 1950, and Conchie, Hay, and Levy[21] and Williams[22] in 1961, suggested the use of glucuronides as tumor inhibiting agents. Working within the context of the unitarian or trophoblastic thesis of cancer, Krebs and others[23] as early as 1925 observed in crude vegetable extracts definitive palliative and therapeutic properties with respect to human cancer. In the 1940's he identified this property with such constituents of β-cyanogenetic glucosides as prunasin (l-mandelonitrile-β-glucoside) and amygdalin (d, l-gentiobioside). These materials were isolated in crystalline form and demonstrated to be non-toxic. Subsequent synthesis of specific glucuronosides such as l-mandelonitrile-β-glucuronoside has provided preparations with therapeutic properties substantially superior to the previously demonstrated activity of the glucosidic nitrilosides.[24] A large homologous series of nitrilosides with widely varying aglycones and sugars, is now under study.

PHARMACOLOGY AND TOXICOLOGY

When the Laetriles are incubated in *vitro* with a β-glucosidase, there is a quantitative and dramatic release of HCN, nascent above its boiling point of 26° C. McIlroy[25] and Edmunds and Gunn[26] have demonstrated a clear counterpart to this reaction in both plants and animals.

The Laetriles are hydrolyzed *in vivo* to free nascent HCN, benzaldehyde, and a sugar or its acid. As previously explained the HCN is detoxified in somatic tissue by rhodanese to thiocyanate, which is then eliminated in the saliva, sweat, bile, and urine. The benzaldehyde is immediately oxidized to benzoic acid and detoxified through the liver by glycine conjugation as hippuric acid and/or glucuronic acid conjugation as benzoyl glucuronoside.

Since these nitrilosides are reasonably homologous with natural compounds found in many edible plants, and since all detoxification products are normal constituents of human blood and urine, they are expectedly free of toxicity. The intact Laetrile molecule is devoid of pharmacological or toxicological properties, these being present only after hydrolysis. Although free HCN is very volatile and may be lethal on inhalation, the cyanogenetic glucuronosides are non-toxic when administered parenterally. One gram of d,l-mandelonitrile-β-glucuronoside contains 30 mg of incipient HCN, and doses of over 5 grams have been administered intravenously without toxic effects. In normal tissues the excess of rhodanese, as compared with β-glucosidase and β-glucuronidase, results in the detoxification of scission products; but as the result of the lack of rhodanese in malignant cells, the HCN released by β-glucuronidase is not detoxified and remains free to exert its lethal effects against such cells and the contiguous somatic in which rhodanese is inhibited by chorionic gonadotrophin. Stern and Willheim[27] in their "Biochemistry of Malignant Tumors" have summarized evidence for the selective sensitivity of cancer cells to cyanides.

The present Laetriles depend for their cancericidal action almost exclusively

upon potential HCN, although Waterman[28] has reported that benzaldehyde impedes the growth of inoculated tumors when brought into direct contact with the inoculum. Utilization of cancericidal aglycones and sugar derivatives will, of course, augment the present cancericidal action. While benzaldehyde and benzoic acid are, for example, antiseptic as well as analgesic, the substitution of an hydroxyl radical in the benzaldehyde ring would of course yield a more active analgesic upon hydrolysis—salicylic acid.

CLINICAL EVALUATION OF LAETRILE

Every chemical, reaction, product of reaction, source of reactant, and means of detoxification described above has been independently established and generally accepted. However, although the high concentration of β-glucuronidase, the apparent presence of a source of estrogen, and the deficiency of rhodanese have been empirically established in all exhibitions of cancer, acceptance of the above explanation of these phenomena in malignancies other than chorionepitheliomas is limited to adherents of the unitarian or trophoblastic thesis of cancer. We therefore feel that the Laetriles should be treated empirically as isolates in terms of ordinary clinical practicability until proof of their utility and acceptance of that proof permits their return to this unified context of Beardianism.

The purpose of this clinical investigation was to determine whether there could be obtained at the malignant focus, a release of HCN of a magnitude sufficient to yield a substantial cytotoxic effect without exposing the host to undue toxicity. With the assistance of several medical associates a wide variety of terminal cancer cases, on whom all conventional methods of treatment had previously proved unsuccessful or inadvisable, were selected.

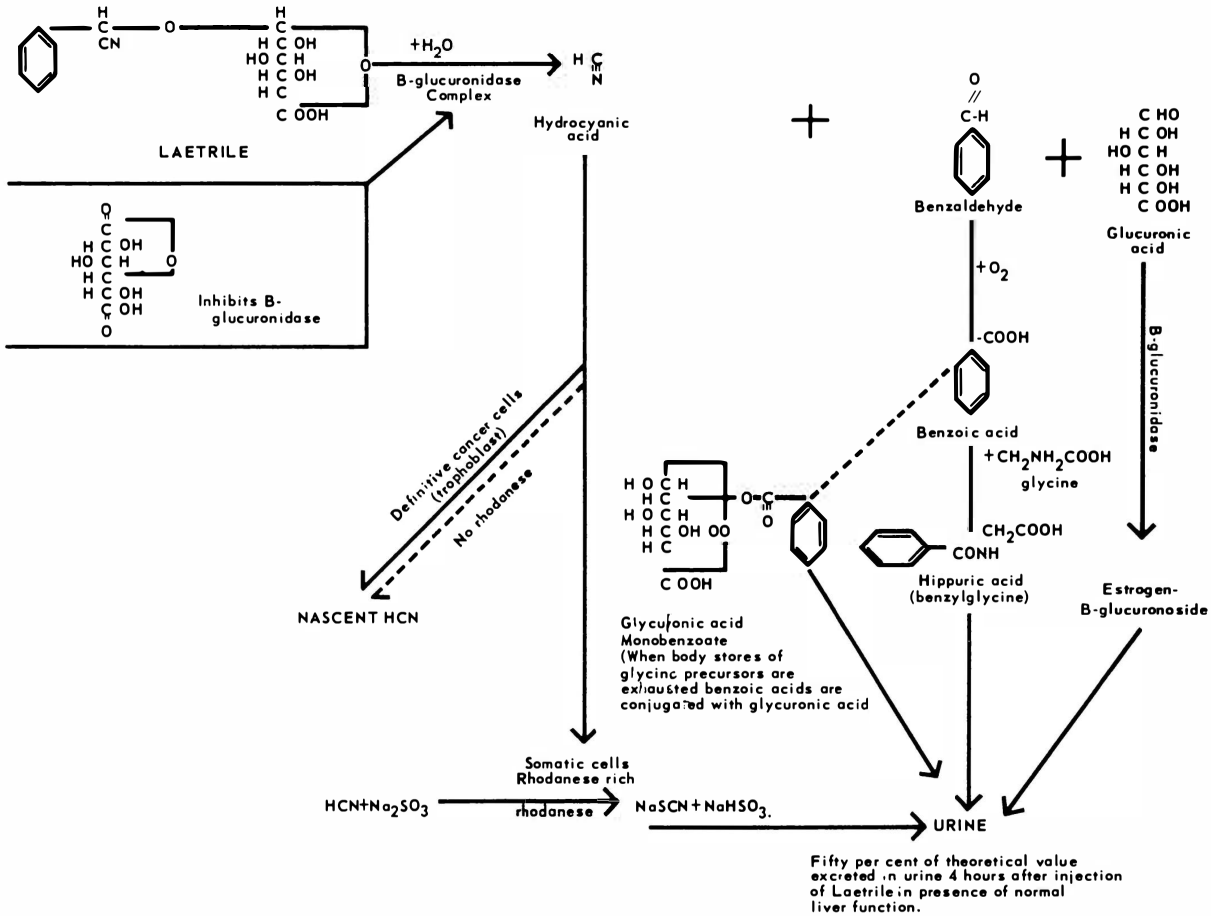
ADMINISTRATION

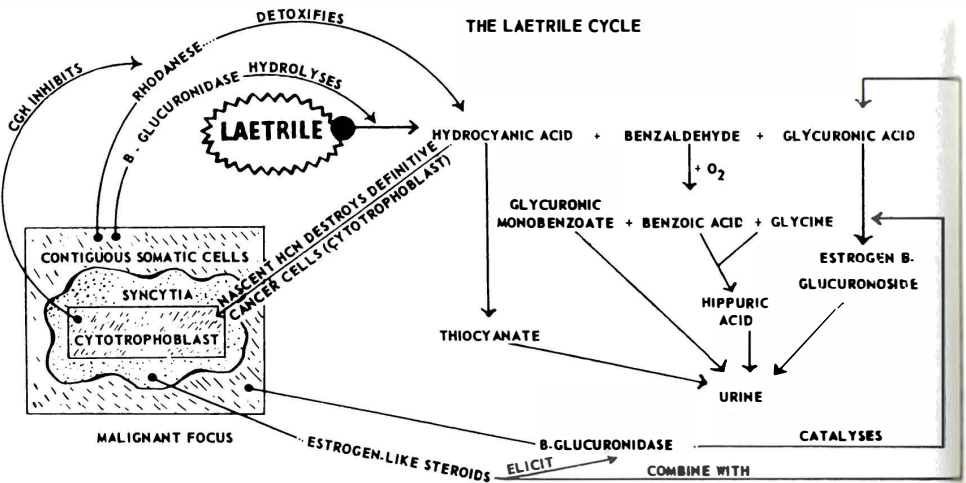
Laetrile is soluble in distilled water or normal salt solution and is administered parenterally. While some clinical investigators have given it intramuscularly, intrapleurally, intraperitoneally, locally, by means of arterial perfusion, and by iontophoresis, we have thus far confined our work to the intravenous and intramuscular, as well as administration by high retention enema and injection directly into certain lesions. Primary and secondary carcinomas of the lung have proved to be the most amenable to this route of therapy, because it avoids the rich reservoirs of β-glucuronidase in the liver, spleen, and kidneys. The most desirable route in malignancies beyond these organs can only be determined by an intelligent consideration of such factors as the underlying anatomy and physiopathology, the extent of the metastases, and the concentration of β-glucuronidase in the cells.

There has been considerable variation in the dosage of Laetrile administered. In the early 1950s Navarro[29] and others used 50-100 mg doses and in 1957 these were increased to 250-500 mg. The total dosage a patient received seldom exceeded 2 grams. We feel now that each patient should receive a minimum of 30 grams. In some cancers, such as carcinoma of the breast, and in instances when only a brief stay in hospital was possible, Laetrile was given in doses of 3 gms per day for 10 successive days. Other doctors have preferred to give 1 gm per day for 30 days.

It is our conclusion that, where time permits, it is most desirable to give the patient 1 gm of Laetrile every second day for the first 1-2 weeks. When it becomes evident that the drug is effective and that the patient is able to tolerate the breakdown of malignant tissue, this should be increased to 1 gm per day until the minimum dosage of 30 grams is attained. Such a routine produces results which are equally as

THE CHEMICAL FORMULA OF ONE LAETRILE MOLECULE AND ITS BREAKDOWN PRODUCTS





Factors	Origin	Action	End Product
B-glucuronidase(*)	Endogenous in soma Elicited in high concentration at lesion by estrogen-like steroids	Detoxifies estrogen-like steroids Hydrolyzes glucuronides	Estrogen-glucuronoside Aglycon and sugar
Rhodanese(*)	Endogenous in soma Absent in Ca lesion	Detoxifies HCN	Thiocyanate
Chorionic gonadotrophin hormone(CGH)	Produced only by cellular trophoblast	Inhibits rhodanese	Unchanged
Estrogen-like steroids	Syncytial trophoblast	Elicit B-glycuronidase from contiguous soma	Estrogen-B-glucuronosides

(*) As enzymes, rhodanese and B-glucuronidase do not terminate in an end product.

good as those obtained with larger doses and seems to offer the advantage of taxing the regenerative processes of the body less severely.

In a few of the most terminal and hopeless cases death ensued before adequate treatment could be given. But many of the patients, having received the basic 30 grams of Laetrile and having then continued on a maintenance dosage of 1-2 grams per week, became ambulatory and gradually resumed their normal activities.

SUPPLEMENTARY THERAPY

It has been our experience that, while Laetrile alone has proved to be effective, even better results can be obtained with some supplementary therapy as well. Pangamic acid is a methylating agent which appears to improve liver function with respect to its capacity to detoxify elements released from the malignant lesion following Laetrile therapy. Our patients received 100-200 mg of pangamic acid intramuscularly daily during their stay in hospital. Thereafter, a similar dosage was given with each maintenance dose of Laetrile. This substance may also be given orally should the patient so request it; but it appears to be more effective when given intramuscularly.

CRITERIA FOR EVALUATION

The progress of our patients was measured by a consideration of the clinical signs and symptoms, and by pathological, cytological, and radiological reports. Samples of the blood and urine were analyzed at intervals to detect any alterations in hematopoietic processes or in renal function during treatment.

RESULTS

Of the cases treated the results appearing in table 1 have been outlined because of the completeness of the data and because they serve to illustrate the wide range of malignancies which respond to Laetrile therapy. It is hoped that the following more detailed descriptions of some of the cases, might further illustrate our conclusions.

CASE #1:

Mr. A.G., 44-year-old radio announcer, was perfectly well until May 1960. When examined on June 7 he complained of dysphagia and otalgia of one month duration. Examination revealed a left anterior tonsillar pillar which was indurated, leukoplasic, and thickened at its inferior insertion. There was no evidence of adenopathy. A diagnosis of epidermoid carcinoma (Grade 1) was made on the basis of histopathological report following biopsy. Because of the radio-resistance of such lesions, the radiotherapy which had been initiated was discontinued and the patient was submitted to cobalt therapy during June, July and August. The lesion continued to progress and his general condition worsened; but, because of his occupation, he refused surgery. By March 20, 1961, cervical brachial, and coronary adenopathy had developed to the extent that surgery was impossible. He had been able to swallow only liquids for six months.

One March 23, 1961, Laetrile therapy (1 gm per day I.V.) plus B15 (100 mg per day I.M.) was begun. After the first 6 grams of Laetrile progression of the lesion was halted and by April 4 he was released from hospital in a much improved condition. Dosage was reduced to 1 gm of Laetrile and 100 mg of B15 twice per week. By June 27, 1961, the dysphagia, adenopathy, and otalgia had disappeared, the primary lesion was considerably reduced in size, and the patient had gained 11 pounds.

During the last year, on a regimen of 1 gm. Laetrile and 100 mg of B15 one to two times per week, his condition has continued to improve and there is no longer any evidence of the primary lesion. With cessation of treatment with Laetrile for more than 6 weeks the dysphagia and otalgia return but there has been no recurrence of the primary lesion or of the cervical adenopathy. The patient should therefore continue on maintenance dosage indefinitely.

CASE #2:

Mrs. G.S., 63-year-old housewife, was first diagnosed as having a glandular epithelioma of the left breast with metastases in Nov. 1959. A radical mastectomy was performed at that time, and from Jan. 22 to April 4, 1960, she received radiotherapy (13,230 r to the left exillary and supraclavicular regions, left chest, and mediastinum) on May 5, 1961, she was admitted to hospital completely incapacitated by pain and by intense dyspnea and severe coughing at the least effort. Physical and radiological examination revealed metastases to the right and left supraclavicular nodes and to both lungs—probably due to radiotherapy. Cytology reports on a left pleural effusion were negative. During her stay in hospital she received 200 mg of B15 intramuscularly each day and 1 gm of Laetrile intravenously every second day from May 24 until July 21. From July 21 to July 28 she received 3 gms of Laetrile per day. Within a month after Laetrile therapy was begun her dyspnea and cough had disappeared and she had become ambulatory. When released from hospital on July 28, 1961, the patient appeared clinically to be greatly improved, although X-ray studies of the lungs showed no change with the exception of the absence of any pleural effusion.

Since that time she continued to receive 1 gram of Laetrile I.V. and 200 mg of B15 I.M. twice weekly. Her pain almost completely disappeared, she is no longer troubled by dyspnea or coughing, and she gradually resumed her normal activities. It can be seen from the table that her blood picture improved and there has been no evidence of any toxicity.

CASE #3:

Mrs. L.N., 52-year-old housewife, was admitted to hospital March 6, 1962, with complaints of metrorrhagia of three months duration (menopause 6 years ago) and of right upper quadrant pain and dyspepsia of fifteen days duration. On the basis of clinical evidence and the cytological report following curettage a diagnosis of adenocarcinoma of the uterus (class V) was made. The patient was started on Laetrile on March 21, 1962, receiving intravenously 1 gm per day for three days and then 500 mg every second day, until her release from hospital on May 22. She was also given 100 mg of B15 every other day during hospitalization. A second cytological report on April 26 revealed no evidence of adenocarcinoma but only of endocervical hyperplasia. Her abdominal pain and metrorrhagia had ceased by this time and she had begun to gain weight. Since her release from hospital we have continued to give her 1 gm of Laetrile I.V. and 100 mg of B15 I.M. twice weekly. She has had no recurrence of symptoms, has regained her appetite and strength, is sleeping better, and does her housework without effort. Her urine, which originally contained traces of albumin and bacteria, mucus, hyalin casts and calcium oxylate crystals, is now normal. Her blood picture has not changed significantly, although Vita-Iron has been used to maintain her hemoglobin levels. No toxicity has been noted.

CASE #4:

This 55-year-old patient, Mr. G.G., was admitted to hospital June 2, 1962. A barium series and cineflurography at another hospital on May 7, 1962, had revealed an epithelioma of the esophagus. There was evidence of mucosal ulceration and of severe narrowing of the lumen for a length of 10 cm at the junction of the middle and lower thirds of the esophagus. At the time of admission to this hospital he was near death—unable to take any solid food and, in fact, even regurgitating liquids. He complained of pain in the right upper quadrant. X-rays of the lungs on June 4 revealed an ill-defined opacity in the right middle lobe suggestive of pneumonia (he had been treated with tetracycline 2 weeks before for pneumonia), and pleural thickening and effusion on the left side. It was uncertain whether left pulmonary metastases were present. The patient was treated with Fortemycin and with 1 gram of Laetrile I.V. and 100 mg of B15 I.M. daily. He required Phenergan and Demerol in order to sleep at night. His pain fever had disappeared within 6 days, and after two weeks in hospital he was able to eat solid foods, had gained twelve pounds, and was ambulatory. X-rays of the lungs on June 16th were normal with exception of some pleural thickening in the left axillary line. On June 24, 1962, the patient was released from hospital. Treatment was reduced to 1 gram of Laetrile I.V. and 100 mg of B15 I.M. every second day. X-ray studies of the lungs on July 27th were normal. A barium meal at this time revealed that the mucosa of an 8 cm segment of the distal third of the esophagus was irregular and that the lumen was somewhat reduced in calibre, but that the barium passed through without obstruction. The patient at present feels well and has returned to work. He no longer requires analgesics to sleep. His urine has been normal throughout the course of treatment; but his hematocrit and hemoglobin, which were 31% and 10.2 gm% respectively on June 4 had increased to 37% and 11.8 gm% respectively by July 7. There has been no evidence of toxicity.

CASE #5:

Mrs. G.M., 53 years old, was first discovered to have a glandular epithelioma of the ascending colon on August 20, 1961, at which time a resection and anastomosis was done. One Feb. 15, 1962, she presented with symptoms of obstruction. This was confirmed by barium enema and a second operation was performed on Feb. 20. A recurrence of the glandular epithelioma was found at the site of anastomosis; this had spread to involve the posterior abdominal wall, a number of mesenteric lymph nodes, and the greater omentum. It was impossible to excise the entire mass, but a side to side anastomosis of the terminal part of the ileum and the transverse colon was performed to relieve the obstruction.

She was then started on Laetrile, receiving 500 mg I.V. every second day for six days, then 1 gm per day for another six days. She has received 1 gm of Laetrile every second day since that time, and has also been given 200 mg of B15 I.M. with each injection of Laetrile. At present she is feeling very well and is able to perform her household duties without difficulty. Her pain and colic is greatly diminished, her appetite has improved, her bowels are functioning normally, and she has no difficulty sleeping. There has been a noticeable reduction in the size of her abdominal mass. Urinalyses have remained normal and her hemoglobin, which had dropped to 10.6 gm% following her operation in February has increased to 11.7 gm%. There has been no indication of any toxicity.

LEGEND

ABl - Ablated
Abn - Abnormal
Ca - Carcinoma
S.R., - Slight reduction
Gland. Epith - Glandular Epithelioma
N.A.C. - No appreciable change
R Hw. - Resumed housework
R. W. - Resumed work
Inc - Increased
AL - After Laetrile
BL - Before Laetrile
Imp. - Improved
R - Reduced
NR - Not recorded
O - None present
N - Normal

Patient	#1 - A.G.	#2 - G.S.	#3 - L.N.	#4 - G.G.	#5 - G.M.	#6 - A.L.
Age	44	63	52	55	53	60
Sex	M	F	F	M	F	M
Diagnosis	Epidermoid Ca. (grade 1) L. Ant. Tonsillar Pillar	Gland. Epith L. breast with metastases	Adeno Ca. of Esophagus	Gland. Epith Ascending colon	Gland. Epith Ascending colon	Bronchogenic Ca. (Gr. III/IV) L. Sup. Lobe
Method & Date of Diagnosis	Biopsy 1-6-60	Biopsy	Cytology, Curettage 20-3-62	Barium Meal Cineflurography 7-5-62	Biopsy 20-8-61 Barium Enema 15 2 62	X-ray 12-1-62 Cytology & Biopsy 16-1-62
Treatment prior to Laetrile	Radiotherapy cobalt therapy	Rad. Mastectomy 13-11 59 Radiotherapy (13,230)	None	Phenergan & Demerol	Surgery 20-8-61 20-2-62	Pneumonectomy
Laetrile						
Date begun	22-3-61	24-5-61	3-62	2-6-62	2-62	20-2-62
Dose	1 gm	1-3 gm	.5-1 gm	1 gm	.5-1 gm	1 gm
Frequency	1-7 d	1-4 d	1-7 d	1-2 d	1-2 d	1-4 d
Approx dosage to date	92 gms	236 gms	34 gms	44 gms	77 gms	70 gms
Supplements	B15	B15	B15	B15 Demerol Phenergan	B15	B15

Effect of therapy upon:						
Pain	Abl	Abl	Abl	Abl	R	Abl
Tumor	R	Exc'sed	R	R	R	R
Adenopathy	Abl	Abl	R	O	R	O
Weight	Inc.	R-on diet	Inc.	Inc.	S1.R.	Inc.
Appetite & Digestion	Imp.	Imp.	Imp.	Imp.	Imp.	Imp.
Bowels	N	N	N	N	N	N
Dyspnea	O	Imp.	O	O	O	O
Cough	O	O	O	O	Imp.	O
Dysphagia	Abl	O	O	Imp.	O	O
Actiivty	Inc.	R Hw	R. Hw.	R. W.	R. Hw.	Imp.
Sleep	N	Imp.	Imp.	Imp.	Imp.	Imp.
Adverse effects	None	None	None	None	None	None
Urinalysis:						
Before	N	N	Abn.	N	N	Abn.
After	N	N	N	N	N	N
Hemogram:						
Date:	BL	10-5-61	7-3-62	4-6-62	19-2-62 9-4-62	12-1-61
Before RBC's	NP	3,700,000	NR	NR	4.500,000 3.990.000	4,500,000
WBC's	NP	12,400	6,850	14,400	10,500 8 550	11,100
Hb	NP	9.6 gm%	87%	10.2 gm%	12 gm% 10.6 gm%	13.5 gm%
Date:	12-6-62	3-3-62	30-5-62	7-7-62	19-7-62	24-5-62
After RBC's	4,600,000	4,700 000	NR	NR	3,900,000	4,600,000
WBC's	10,000	11,500	10,800	12,500	8.500	8,300
Hb	14.1 gm%	12.5 gm%	90%	71.8 gm%	11.7 gm%	14.3 gm%

LEGEND

Abl - Ablated
Abn - Abnormal
Ca - Carcinoma
Gland. Epith - Glandular Epithelioma
N.A.C. - No appreciable change
R. Hw. - Resumed housework
Inc - Increased
Al. - After Laetrile
Bl. - Before Laetrile
R - Reduced
Nr. - Not recorded
O - None present

Patient	#7 - D.D.*	#8 - A.F.	#9 - L.H.	#10 - L.G.	#11 - J.R.	#12 - B.B.**
Age	60	57	59	73	61	45
Sex	M	F	F	F	M	F
Diagnosis	Epithelioma of tongue	Ca. of Sigmoid with spread to adjacent nodes	Ca. of stomach Liver metastases	malignant cells in pleural effusion primarily suspended in 1. lung (atelectasis)	Adeno Ca. of Rectum	Ca. of 1. breast with osseous metastases (ribs) spine, femurs) no biopsy made
Method & Date of Diagnosis	Biopsy	Sigmoidoscopy Laparotomy Biopsy 1-12-61	Gastrectomy 1950	Cytology 3-5-61 25-5-61 (III-IV)	Barium Enema 23-5-61 Biopsy 31-5-61	Metastases proven by X-ray
Treatment prior to Laetrile	Radiotherapy 24-4-61 to 12-7-61	Surgery 1-12-1	None			
Laetrile Date begun	17-8-61	19-12-61	27-6-61	10-5-6	6-61	6-61 to 11-61: 3-62 - 4 to 62
Dose	1 gm	1 gm	1-3 gms	1 gm	1 gm	1 gm
Frequency	1-3 d	1-4 d	1-4 d	1-3 d	1-4 d	1-2 d
Approx. dosage to date	63 gms (12-1-61)	55 gms	80 gms	166 gms	120 gm	80 gms
Supplements	B15	B15	B15	B15	B15	B15 Stilbesterol

Effect of therapy upon:						
Pain	N.A.C.	O	Abl.	R	Abl.	Abl.
Tumor	Excised	Excised	R	O	Excised	R
Adenopathy	O	Excised	O	O	O	O
Weight	N.A.C.	Inc.	N.A.C.	Inc.	N.A.C.	Inc.
Appetite & Digestion	Imp.	Imp.	Imp.	Imp.	Imp.	Imp.
Bowels	N	Imp.	N	N	Imp.	N
Dyspnea	O	O	O	Imp.	O	O
Cough	O	O	O	O	O	O
Dysphagia	O	O	O	O	O	O
Activity	N.A.C.	R. Hw.	R. Hw.	Inc.	R. W.	Inc.
Sleep	N.A.C.	N	N	N	N	Imp.
Adverse effects	None	None	None	None	None	None
Urinalysis:						
Before	N	Abn.	Abn.	N	NR	N
After	N	N	N.A.C.	N	Abn.	N
Hemogram:						
Date:	BL	BL	9-6-61	1-5-61	31-5-61	BL
Before RBC's	4,300,000	3,800,000	3,900,000	N	4,800,000	3,960,000
WBC's	9,100	14,700	6,800			
Hb	84%	10.1 gm%	12 gm%	12.35 gm%	12.4 gm%	78%
Date:	AL	AL	6-6-62	5-6-62	10-5-62	AL
After RBC's	4,280,000	4,000,000	4,400,000	4,300,00	4,800,000	3,840,000
WBC's	10,100	9,300	9,300	6,000	10,000	7,800
Hb	84%	12 gm%	13.5 gm%	12.4 gm%	14.3 gm%	79%

* This patient was in excellent health, with no evidence of primary lesions when he stopped therapy (12-1-61). On 3-8-62 recurrence of primary lesion was noted and therapy resumed.
** Sites of osseous metastases have recalcified since initiation of therapy.

CONCLUSION

To maintain that any of these patients has been cured—"cure" being defined as a five-year period free of tumor recurrence—is not our purpose. In accordance with the concepts of Beardianism, cancer, like pallegra or scurvy, is a deficiency disease which must be controlled either permanently or until the enzymatic deficiency of the pancreas is rectified. It appears to us that the effectiveness of the Laetrile as much a palliative has been clearly demonstrated in a wide variety of malignant exhibitions, particularly in primary and secondary neoplasms of the lung.

It is also very evident that Laetrile possesses strong analgesic properties; and, although none of the patients mentioned in the above reports were troubled with fetor, in other cases treated this symptom was also relieved when present. Furthermore, there has been no indication of any toxicity in any of our cases in spite of the large amounts of Laetrile administered. In view of these facts it would seem only reasonable to suggest that this drug be more properly evaluated prior to the use of other palliatives, immediately following the detection of cancer.

It should be remembered, too, that to date the successful resolution of the anemias, vitamin deficiencies, and all other chronic diseases has only been accomplished by non-toxic physiologic means of prophylactic significance. Whether the systemically non-toxic and apparently cancericidal Laetriles are also of preventative as well as palliative import is certainly worthy of additional scrutiny.

SUMMARY

1) Malignant tumors are focally characterized by a high concentration of β-glucuronidase and a deficiency of rhodanese.
2) Specific nitrilosides (Laetriles), which upon hydrolysis yield hydrogen cyanide, an aglycone (benzaldehyde) and a sugar moiety, have been prepared to exploit this β-glucuronidase-rhodanese pattern.
3) Following parenteral administration there appears to be released in a wide variety of selectively sensitive malignant tissues such an excess of nascent HCN as to produce effects of definite palliative, and possible prophylactic, consequences in human cancer.
4) Laetrile also possesses strong analgesic properties and shows no evidence of any toxicity.
5) On the basis of the results reported in this paper and those obtained by other clinical investigators using Laetrile, it is suggested that this drug might be more properly evaluated in less terminal cases untreated by other palliatives.

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